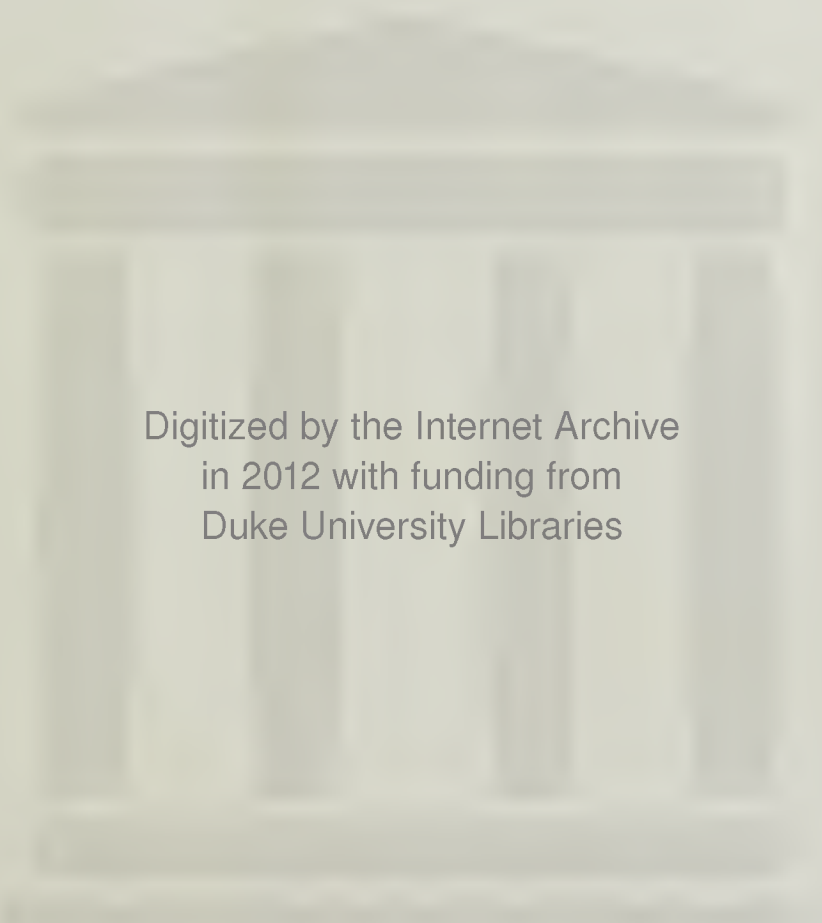


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bulletin of
Duke University 1983-84

School of Forestry and Environmental Studies



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Duke University 1983-84

School of Forestry and Environmental Studies

EDITOR
Judy A. Beck
SENIOR EDITORIAL ASSISTANT
Elizabeth Matheson
PUBLIC RELATIONS SPECIALIST
Mary L. Matthews
School of Forestry and Environmental Studies

PHOTOGRAPHS
Lee Krohn
Janet Ohmann
Tom Rutledge
Thad Sparks

COVER DESIGN
Donna S. Slade

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University Administration

General Administration

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Administration of the School of Forestry and Environmental Studies

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Phillip M. Simpson, B.A., *Assistant Dean for External Affairs*
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Faculty

Robert L. Barnes, Ph.D., *Professor*; B.S., Botany, M.F., Forest Soils, Ph.D., Plant Biochemistry, Duke University.

Current research interests: biological bases of forest productivity; development of tree and stand growth models based on physiological and biochemical processes; optimization of forest productivity within biological, environmental, managerial, and economic constraints.

Daniel E. Binkley, Ph.D., *Research Associate*; B.S.F., Forest Management, Northern Arizona University; M.S., Forest Ecology, University of British Columbia; Ph.D., Forest Ecology, Oregon State University.

Current research interests: regulation of forest productivity by nutrient cycles, including nitrogen fixation, methods of assessing forest nutritional status, reciprocal effects of vegetation on soils, and effects of stand treatments on nutrient cycling processes.

Stephen G. Boyce, Ph.D., *Adjunct Professor*; B.S., M.S., Forestry, Ph.D., Plant Ecology, North Carolina State University.

Current research interests: biological potential for timber production in relation to all forest benefits; integration of ecosystem dynamics and silviculture to provide forest benefits in the context of social, economic, and political forces.

Robert Boyd, Ph.D., *Assistant Professor*; B.A., Physics, University of California, San Diego; Ph.D., Ecology, University of California, Davis.

Current research interests: mathematical ecology and resource and environmental economics. Energy economics with particular regard to electricity supply; energy systems and policy. Evolutionary ecology, in particular, culture, biology, and the evolution of variation of human behavior.

Jan-Willem Briede,* M.S., *Research Associate*; B.S., Animal Science, State College for Agriculture, Dordrecht, The Netherlands; M.S., Range Science, Utah State University.

Current research interests: land use and management in lesser developed countries; response of plant communities to grazing, logging and other disturbances; revegetation. Arid and semiarid lands development.

Norman L. Christensen, Jr., Ph.D., *Associate Professor*; B.A., M.A., Biology, California State University, Fresno; Ph.D., Biology, University of California, Santa Barbara.

Current research interests: the effects of disturbance on the structure, function, and development of plant populations and communities; in particular, patterns of forest development following cropland abandonment as these are affected by environment, stand history, and patterns of seed rain. Research on the southeastern coastal plain is focused on a comparative study of biogeochemical and community responses to varying fire regimes.

William K. Condrell,* J.D., *Adjunct Professor*; B.S., Industrial Economics, Yale University; S.M., Business and Engineering Administration, Massachusetts Institute of Technology; J.D., Harvard University.

Current research interests: income, estate and gift, and property taxation of timber. In particular, the development of tax systems which maximize timber growth and effective forest utilization from the viewpoint of both the national interest and timber ownerships of all sizes.

William C. Davis, Ph.D., *Assistant Professor*; B.A., Sociology, Knox College; M.F.S., Forestry, Ph.D., Silviculture, Yale University.

Current research interests: silvicultural manipulation of forest stands, development of even-aged mixed stands, and natural regeneration systems. Partial cutting as a means of maximizing stand productivity and economic return. Control or manipulation of hardwoods in old field pine stands and plantations.

Alexander T. Davison,* M.F., *Adjunct Assistant Professor*; B.S., Botany, M.F., Forest Entomology, Duke University.

Current research interests: application of remote-sensing techniques to forest resource management problems; development of appropriate management strategies for private forest landowners; forest insect pest control through forest management techniques.

Richard T. Di Giulio, Ph.D., *Assistant Professor and Research Associate*; B.A., University of Texas; M.S., Wildlife Management, Louisiana State University; Ph.D., Wildlife Biology, Virginia Polytechnic Institute and State University.

Current research interests: integration of ecological and toxicological principles and methodologies in hazard assessment of environmental contaminants. Accumulation and transport phenomena of contaminants in natural systems; impacts of contaminants on biota, particularly higher vertebrates. Estuarine, wetland, and waterfowl ecology.

George F. Dutrow, Ph.D., *Adjunct Associate Professor*; B.S., General Science, M.F., Wood Technology, Ph.D., Forest Economics, Duke University.

Current research interests: measuring the physical and financial implications to the landowner, region, and nation of silvicultural treatments to increase timber supplies and other products of forest lands. Quantifying and developing the implications of applying or omitting research recommendations for forest management. Estimating net economic results of the evolving technologies of genetically improved or disease resistant planting stock, forest fertilization, and site selection and modification. Evaluating alternative land use programs, management treatments, and policies in terms of economic and physical outputs and trade-offs of services and products from forest lands. Examining methodologies for ascertaining future prices, rates of discount, investment criteria, and distributional effects of various management policies.

Daniel H. Gelbert,* M.F., *Adjunct Assistant Professor*; B.S., pre-Forestry, M.F., Forest Management, Duke University.

Current research interests: development of management plans for private, nonindustrial ownerships; development of case history and case study approaches to management instruction and research.

*Denotes faculty not in full-time residence at Duke University.

William J. Hart,* M.P.A., *Adjunct Professor*; B.S., Forestry, Utah State University; M.P.A., Resource Economics and Administration, Harvard University.

Current research interests: developing regional case studies for teaching and research in the interactions of diverse disciplines, government agencies, and clientele groups that occur in preparing and implementing plans for forests, parks, and water in urban and rural settings. Establishing permanent outdoor laboratories and supporting information programs for the systematic, long-term study of outdoor recreation phenomena, including user behavior, cost-effective management techniques, and natural resource system response.

Milton S. Heath, Jr.,* LL.B., *Adjunct Professor*; A.B., Harvard; LL.B., J.D., Columbia University.

Current research interests: environmental and natural resource law and administration; legislative and other governmental aspects of resource development.

Henry Hellmers, Ph.D., *Professor*; B.S., Forestry, M.S., Forestry, Pennsylvania State University; Ph.D., Plant Physiology, University of California, Berkeley.

Current research interest: physiology of forest trees, primarily in the area of environmental factor effects.

William F. Hyde, Ph.D., *Assistant Professor*; A.B., International Relations, American University; M.A., Economics, M.S., Natural Resources, Ph.D., Resource Economics, University of Michigan.

Current research interests: economics and policy aspects of regulation and deregulation in the natural resources based industries; land management, timber supply, and allocation policy for natural resources.

Benjamin A. Jayne, Ph.D., *Professor*; B.S.F., Forestry, University of Idaho; M.F., Forestry, Ph.D., Forestry, Yale University.

Current research interests: management of natural resource systems. In particular, the application of mathematical models, including simulation and optimization techniques, to decision making in the management of renewable resources. The application of physical theory to the transport of mass and energy in terrestrial and aquatic ecosystems including concepts from thermodynamics and fluid mechanics. Development of basic theory for predicting the physical properties of particulate materials such as soils and other composite media.

Kenneth R. Knoerr, Ph.D., *Professor*; B.S.F., Forestry, University of Idaho; M.F., Forestry, Ph.D., Yale University.

Current research interests: development of predictive models for the energy and mass exchange processes and the state of the atmosphere that characterizes the biological environment (the microclimate). These physical models can be interfaced with other biological models to give a better understanding of how biological systems interact with, respond to, and are controlled by their environment. The models can also be used to solve more applied problems such as those concerned with the primary production of forest stands, effects of land management practices on water yield, or the impact of environmental perturbations on the ecosystem. In parallel with the modeling there has been an intensive experimental effort to collect physical environment and biological data to both test and improve the models. Future work will include the development of models for special purposes, such as prediction of characteristics of the microclimate from infrared mapping of the surface radiometric temperature.

Lynn A. Maguire, Ph.D., *Assistant Professor and Research Associate*; A.B., Biology, Harvard University; M.S., Resource Ecology, University of Michigan; Ph.D., Ecology, Utah State University.

Current research interests: application of quantitative methods, including simulation modeling, statistics and decision theory, to ecological aspects of resource management and land use planning. Modeling the ecology of forest production. Forest and wildlife interactions.

Carlos M. Marin, Ph.D., *Assistant Professor*; B.S., Civil Engineering, M.S., Environmental Science and Engineering, Rice University; S.M., Ph.D., Environmental Science and Engineering, Harvard University.

Current research interests: identification and coupling of statistical and physically based hydrologic models in water resource systems planning and management. Development of techniques for incorporation of parameter and model uncertainty and risk/performance indices in the evaluation of alternative management strategies. Regionalization of spatial information using empirical Bayes methods. Investigation of the temporal dependence structure of hydrologic time series.

Jane Philpott, Ph.D., *Professor*; A.B., Education and Biology, Harris Teachers College; M.S., Botany, Ph.D., Botany, University of Iowa.

Current research interests: anatomy of woody plants, with emphasis on anatomy of leaves growing in different environments.

Charles W. Ralston, Ph.D., *Professor*; B.S.F., Forestry, Colorado State University; M.F., Forest Soils, Ph.D., Forest Soils, Duke University.

Current research interests: forest soil-site classification through the study of physiographic and edaphic characteristics related to forest site productivity. Derivation of multiple regression soil-site prediction equations. Development of equations for estimating biomass and nutrient contents of forest stands from diameter and height measurements. Study of improvement of forest sites via drainage, disturbance of forest soils by logging, effects of fire on soil physical and chemical properties, and effects of intensive forest management practices on quantity and quality of streamflow. Diameter growth of loblolly pine as related to soil water supplies; nutrition of slash pine seedlings as related to light, temperature, and aeration; oxidation-reduction reactions of soils.

Kenneth H. Reckhow, Ph.D., *Assistant Professor*; B.S., Engineering Physics, Cornell University; M.S., Ph.D., Environmental Science and Engineering, Harvard University.

Current research interests: water quality modeling and applied statistics. Lake eutrophication modeling and the quantification of model prediction uncertainty using first order error analysis and Monte Carlo simulation; confirmation and transferability of models. Decision and risk analysis for water quality management. Analysis of spatial-temporal variability in water quality.

Curtis J. Richardson, Ph.D., *Associate Professor*; B.S., Biology, State University of New York at Cortland; Ph.D., Ecology, University of Tennessee.

Current research interests: ecosystem analysis of wetland and forest systems. Specific research on the linkages between terrestrial and aquatic ecosystems and the effects of large-scale perturbations on such systems. Studies at the process level include productivity, biogeochemical cycling, and soil chemistry/plant nutrition relationships in wetlands and forest systems. Applied ecology research includes studies on clearcutting, wastewater applications on ecosystems, reclamation of alkaline soils, and wetlands management.

Jack P. Royer, Ph.D., *Assistant Professor*; B.S., Forestry, Pennsylvania State University; M.S., Public Affairs, American University; Ph.D., Natural Resources, Cornell University.

Current research interests: natural resource policy and administration of forests, land and water resources, and outdoor recreation. Environmental law. Application of resource economics, resource planning, and various analytical methods to formulation of resource policy.

C. Ford Runge,* Ph.D., *Adjunct Assistant Professor*; B.A., University of North Carolina at Chapel Hill; M.A., Politics, Philosophy, and Economics, Oxford University, Great Britain; Ph.D., Agricultural Economics, University of Wisconsin at Madison.

Current research interests: environmental policy and applied public choice theory; agricultural policy and international strategic relations.

William R. Sizemore,* Ph.D., *Adjunct Professor*; B.S., Forestry, Louisiana State University; M.F., Duke University; Ph.D., Forestry, University of Georgia.

Current research interests: impact of all types of taxes on forest landowners, industrial and nonindustrial. In the field of federal taxation, the combined effects of income and estate taxation are of special interest. Management information systems for forest operations.

William J. Stambaugh, Ph.D., *Professor*; B.S., Forestry, M.S., Forestry, Pennsylvania State University; Ph.D., Forest Pathology, Yale University.

Current research interests: pathology of woody plants. Ecology of soil microorganisms with emphasis on mycorrhizae and root diseases of trees. Disease control strategies including biocontrol systems.

J. Michael Vasievich, Ph.D., *Adjunct Assistant Professor*; B.A., Biology, Franklin and Marshall College; M.F., Forestry, Ph.D., Forest Economics, Duke University.

Current research interests: investment analysis of forest land management alternatives, especially intensive timber production, short rotation biomass production, and multiple product trade-offs; simulation techniques and use of the microcomputer in forest economics problems. Economic analysis of fire and pest impacts and management strategies with emphasis on prescribed burning.

P. Aarne Vesilind, Ph.D., *Associate Professor*; B.S., M.S., Civil Engineering, Lehigh University; M.S., Sanitary Engineering, Ph.D., Engineering, University of North Carolina at Chapel Hill.

Current research interests: wastewater and sludge management and disposal. Solid waste and resource recovery problems.

Lecturers

John A. Busterud, J.D., Yale University; *RESOLVE*, Center for Environmental Conflict Management
William Bentley, Ph.D., University of California; *University of Connecticut*

Marion Clawson, Ph.D., Harvard University; *Resources for the Future*
Richard Cummings, J.D., Columbia University; *State University of New York*
Sam Guttenberg, M.P.A., Harvard University; *Consultant, New Orleans, Louisiana*
Sid McKnight, M.F., Yale University; *Consultant, Atlanta, Georgia*
Philip S. McMullan, Jr., M.B.A., University of Pennsylvania; *Research Triangle Institute*
Thomas O. Perry, Ph.D., Harvard University; *North Carolina State University*
Clark Row, Ph.D., Tulane University; *United States Forest Service*
William C. Siegel, J.D., Loyola University of the South; *United States Forest Service*
Dennis C. Stickley, J.D., University of Wyoming; *Legislative Counsel, United States Senate*
William A. Thomas, Ph.D., University of Minnesota, J.D., University of Tennessee; *American Bar Foundation*

Professional Staff

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Patrick J. Tyson, M.A., *Lecturer and Director of Summer Programs*

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Frederick C. Joerg, M.B.A., *Professor Emeritus*
Paul Jackson Kramer, Ph.D., *James B. Duke Professor Emeritus*
James Granville Osborne, B.S., *Professor Emeritus*



School of Forestry and Environmental Studies

Calendar*

1983

August	
24-26	Registration for fall semester
31	Fall semester classes begin
September	
1	Drop/add begins
5	Labor Day holiday
12	Drop/add ends
October	
20	Thursday, fall recess begins at 6 P.M.
24	Monday, classes resume at 8 A.M.
November	
1-4	Registration for spring semester, 1984
22	Tuesday, Thanksgiving recess begins at 6 P.M.
28	Classes resume at 8 A.M.
December	
12	Fall semester classes end
13-14	Graduate reading period
15-21	Final examinations

1984

January	
6	Registration of all new and nonregistered returning students
9	Spring semester classes begin
10-20	Drop/add period
March	
12	Monday, spring recess begins at 6 P.M.
19	Classes resume at 8 A.M.
21-23	Registration for fall semester, 1984, and summer, 1984
April	
20	Spring semester classes end
21-23	Graduate reading period
24-30	Final examinations
May	
6	Commencement

*The dates in this calendar are tentative and subject to change.



To the Prospective Student

The School of Forestry and Environmental Studies, a professional-graduate school functioning within a great university, focuses its efforts on forestry, natural resources, and the environment. Its Master of Forestry degree is designed to prepare professional forest managers of the future in both the public and private sectors. Its Master of Environmental Management degree is intended for those who wish to prepare themselves in some aspect of the broader field of natural resources. The school offers concurrent degrees with the Fuqua School of Business and the Institute of Policy Sciences and Public Affairs. Its doctoral program is designed for those interested in teaching or in research in a university, branch of government, or industry.

We seek able students who are motivated to research and analyze complex natural resource and environmental problems. We accept undergraduates from many educational backgrounds. However, we expect that each degree candidate will become highly disciplined in some aspect of the analysis of resource problems during the period of study at Duke.

To complement our traditional modes of education, we have introduced several new educational programs during the past few years, each under the direction of a professional staff member. A number of students participate in the Integrated Case Studies Program in Natural Resource Analysis described in this bulletin. Our Senior Professional Program is designed to meet the needs of practicing professionals who wish to update practical skills or to pursue an advanced degree. Internships are available to qualified students. Supporting all of these educational programs are the research interests of an outstanding faculty committed to the advancement of knowledge concerning resources and the environment.

The following pages provide information about our degrees, programs of study, and research. We invite you to visit the Duke campus to meet our students, faculty, and professional staff, and to learn about our school first hand.



Benjamin A. Jayne
*Dean of the School of Forestry and
Environmental Studies*

General Information



Objectives

The School of Forestry and Environmental Studies pursues a broadly based program of research and education at the graduate level. Its programs are designed to educate professionals, scientists, and academicians to analyze a wide range of environmental and natural resource problems.

After nearly fifty years of forestry research and education at Duke, the school has shifted from a focus on woodland productivity and protection to a focus on ecosystem productivity and protection. The land and its associated components, including plant and animal communities, water, and air, are integral parts of the orientation of the school. The emphasis is on defining objectives for forest and natural resource management, understanding the interrelated constraints—physical, biological, ecological, economic, legal, and social—and devising and testing alternative management solutions. Indeed, problem analysis is the central focus of all programs of the school. The student will learn the capabilities and limitations of quantitative analysis and seek imaginative solutions for problems requiring a qualitative approach.

The school is particularly interested in the development of a holistic view of the environment and natural resources. This viewpoint requires the application of knowledge from the natural, social, and management sciences. Students are encouraged to integrate studies in natural resource science, systems science, economics, and policy in the pursuit of a particular program of study. The approach is first to identify problems, then to synthesize information, to develop critical analyses, and finally to plan and design solutions.

This approach is pursued by research, formal courses, seminars, field studies, and special conferences and symposia. Informal contact among students, faculty, alumni, and practicing professionals forms a strong part of the program. A number of academic and professional disciplines are represented on the faculty, and practicing professionals are frequently involved in teaching as well as in research. Several government career employees are usually in residence as adjunct faculty members.

The school periodically sponsors conferences and symposia on subjects of major interest and concern to persons involved in resource management. These offer current viewpoints of outstanding individuals concerned with various aspects of natural resources and the environment.

Programs are designed for students drawn from a wide variety of undergraduate backgrounds in the natural and social sciences and from programs in forestry, engineering, business, and environmental studies. The goal is to help all students

acquire the basic technical skills, knowledge, insight, and methods of analysis for solving natural resource and environmental problems.

Because integrated management of natural resources is in the early stages of development in this country and abroad, the school is changing rapidly and extensively. These changes offer many opportunities to explore new areas of research and education, to sharpen the capacity to analyze environmental and resource problems, and to contribute to the development of new professions.

An essential ingredient in this period of changing orientation in the school is a high level of student participation. A special student committee advises the dean and faculty on curriculum content and structure, research programs, degree requirements, and other matters pertinent to the goals of the school. Students serve on most school committees, and they attend faculty meetings on a regular basis. Students also participate regularly in the planning of major conferences and symposia. Within the limit of school resources, students are encouraged to travel to local and regional meetings of professional and scientific societies. These activities are considered to be an essential part of the educational process.

History

Duke University developed from Union Institute, a small school established in 1838 in Randolph County, North Carolina. The name was changed to Normal College in 1851, and in 1859, to Trinity College. The college was moved to Durham in 1892. With the establishment of the James B. Duke Indenture of Trust in 1924, Trinity College became Duke University. At the outset, the University developed around a core of undergraduate programs. Later the Graduate School and professional schools of Medicine, Nursing, Law, Engineering, Divinity, and Business Administration were added. In 1932, forestry instruction was offered for students of Trinity College, and in 1938 the School of Forestry was established as a graduate professional school under the direction of Dean Clarence F. Korstian. The Master of Forestry degree was offered initially and later the A.M., M.S., and Ph.D. were offered through the Graduate School. The school has been fully accredited by the Society of American Foresters since 1939.

Dr. Korstian joined the faculty in 1931 as the first director of the Duke Forest. Brought to Durham by Dr. William P. Few, president of Duke at the time, Dr. Korstian set out to develop a "demonstration and research forest" that would serve as a model for owners of small tracts of timber in the South. During this period and for a number of years to follow, research focused primarily on problems of culture, management, and utilization of the softwoods and hardwoods of southern forests.

During the 1930s the faculty of the school was gradually expanded to include a number of research foresters who made substantial contributions to forestry in the Southeast. William Maughan, who specialized in forest management, joined the faculty in 1931. In 1935, Theodore S. Coile, a specialist in forest soils, was added to the faculty. Ellwood S. Harrar, a wood technologist, and Francis X. Schumacher, widely known for his contribution to forest measurements, arrived at Duke in 1937. In 1939, the school rounded out its initial faculty with three distinguished scientists: Roy B. Thomson in economics, James A. Beal in entomology, and Albert E. Wackerman in forest utilization. This faculty established and brought early recognition to the school. Later, faculty were added in silviculture, pathology, physiology, ecology, and biometeorology.

The expanded faculty was soon responsible for shifting the emphasis from southern forestry to research and teaching of forestry with a national and international point of view. Consequently, graduates of the school have found employment in public agencies, forest industries, education, and research in all parts of the nation.

Growing national concern with natural resources and environmental problems led to a new teaching and research emphasis in the 1970s. A new program in

natural resource ecology, focusing on ecologically based land use planning, was added to the traditional forest science and management curriculum. In 1974 the name was changed to the School of Forestry and Environmental Studies and a new degree was added, the Master of Environmental Management.

Location

Duke University is situated on the outskirts of Durham, a city of nearly 100,000 inhabitants, in the central piedmont region of North Carolina. The Appalachian escarpment lies approximately 100 miles to the west of Durham and the coastal plain is but a short distance to the east. The school is thus ideally situated near areas of ecological and topographic diversity which offer many opportunities for recreation as well as study.

Piedmont North Carolina is characterized by a rolling, forested topography interspersed with small farms and rural communities in addition to the state's largest cities. The climax forests of the piedmont are hardwoods; however, human disturbance over a period of many years has resulted in the establishment of many forests of the native southern pines. It is in regions like piedmont North Carolina that many of the nonindustrial private forests of the United States are located. These forests are destined to provide much of the increase of wood and wood fiber to be needed by the United States in the twenty-first century.

The southern Appalachians are widely known for their unusual history, picturesque topography, and wide range of flora and fauna. Here the typical hardwood forests which dominate at lower elevations give way to forests of spruce and fir at higher elevations. These forests supply a variety of specialty woods for North Carolina furniture manufacturers and for other industries. The region's numerous recreation areas are widely used for hiking, fishing, skiing, and other outdoor activities.

The coastal plain of North Carolina, already well known for its agricultural production, is now being used extensively by many of the nation's forest industries for plantations of the native pines. The extent of the intensive forestry practices in the coastal plains of North Carolina and other southern states is unmatched elsewhere in the world.

Coastal wetlands and estuaries, now recognized as one of the nurseries of world fisheries, offer abundant and valuable natural resources. North Carolina's Outer Banks and the barrier islands of the other southeastern states serve as protection for these coastal waters. The rapidly increasing population and development in this region make proper management of its natural resources particularly important to the nation.

Because of the school's central location near these regions of vital ecological importance, students are afforded the opportunity to study many current environmental problems in the field. Both the opportunity and the challenge exist to analyze these pressing problems and to develop sound approaches to their management.

Facilities

The School of Forestry and Environmental Studies is housed in the south wing of the Biological Sciences Building on the West Campus. Laboratory and supporting facilities are provided for both teaching and research in all subject matter areas offered in the school. Classrooms and seminar rooms are available in the school and in other parts of the building. A clubroom, offices, and general study space are provided for students.

Triangle Universities Computation Center. Students and faculty of the school have immediate access to the Triangle Universities Computation Center (TUCC). TUCC



is equipped with an IBM 3081 computer system which provides the University with computing capability. Computer facilities in the school, which contain a medium speed card reader/line printer terminal, keypunch units, and a cluster of interactive terminals, are easily accessible for student use. Microcomputer laboratories and extensive data processing services are available at other locations within the University.

Libraries. The combined university libraries, including the main Perkins Library and nine school libraries, contain over 3,000,000 volumes. About 150,000 volumes are added annually. Approximately 13,000 periodicals and over 200 newspapers are received. The Biology-Forestry Library, located in the Biological Sciences Building, contains about 125,000 volumes, and receives about 900 periodicals.

Greenhouses and the Phytotron. Adjoining the Biological Sciences Building are excellent facilities for biological investigations under controlled conditions. The phytotron contains fifty separately controlled growth chambers and greenhouses which can be used to grow trees under a variety of environmental conditions. The phytotron is one of few such facilities in the United States.

Research Triangle Park. Numerous industrial and governmental organizations have established research facilities in the Research Triangle Park, ten miles from the Duke campus. Government facilities include the National Environmental Research Center of the Environmental Protection Agency, the Forestry Sciences Laboratory of the United States Forest Service Southeastern Forest Experiment Station, and the National Institute of Environmental Health Sciences of the Department of Health, Education and Welfare. These laboratories provide opportunities for student research and internships in some of the most advanced facilities in the nation.

Neighboring Universities. Through a reciprocal agreement, Duke students may supplement their education in forestry and environmental studies by taking courses in related fields at the University of North Carolina in Chapel Hill, North Carolina State University in Raleigh, and North Carolina Central University in Durham. Graduate students of Duke University and the University of North Carolina at Chapel Hill are granted library loan privileges in both universities.

The Duke Forest

The Duke Forest comprises approximately 8,300 acres of land in five major divisions and several smaller tracts. A ten-minute walk from campus will take one well into many parts of the Durham Division, and a network of roads and fire trails make almost all areas of the forest easily accessible.

The forest lies primarily in Durham and Orange counties, near the eastern edge of the piedmont plateau, and supports a cross section of the woodlands found in the upper coastal plain and lower piedmont of the Southeast. A variety of timber types, plant species, soils, topography and past land use conditions are represented. Elevations range from 260 to 760 feet. Soils of the region are derived from such diverse parent materials as metamorphic rock of the Carolina slate formation, granite, Triassic sedimentary rock, and basic intrusives.

The Duke Forest, as it is known today, had its origins in the mid-1920s when the University administration bought many small farms and interspersed forest land as buffer areas for the main campus and as an investment for the future. The forest was placed under intensive management in 1931 by Dr. Clarence Korstian, its first director. In its early development, several basic objectives were emphasized: (1) demonstration of timber management techniques on a practical and economic basis, (2) development of an experimental forest for research in the sciences associated with timber growing, and (3) development of the area as an outdoor laboratory for students of forestry.

Modification of these early objectives has arisen, in part, through a greatly increased interest and dependence on the forest for research in the areas of

zoology, botany, and ecology by faculty and students at Duke and neighboring universities. Background information useful to researchers is provided by the forest; it covers such features as soils, topography, inventory, plantation, and cultural records as well as a bibliography of past and current studies. Current work on problems associated with developmental pressures at the urban-rural interface and integrated approaches to natural resource management have multiplied the forest's value and benefit as a resource.

Since 1976, the Duke Forest has been included in a nationwide network of research sites selected by the Institute of Ecology under a program sponsored by the National Science Foundation. These sites, designated as experimental ecological reserves, were selected to provide a wide range of conditions and habitat types for long-term scientific research in a multitude of disciplines.

The forest also serves in an educational and recreational capacity for residents of the Durham and Chapel Hill communities. Hiking, picnicking, jogging, and nature study are particularly popular pastimes.

This natural outdoor laboratory is an invaluable supplement to the instructional, research, and recreational facilities of the school, the University, and the region.

A comprehensive forest management plan, completed in 1981, provides a framework of basic guidelines and policies enabling effective utilization of the forest's potential. Development of the management plan was coordinated by a team of faculty, staff, and students representing a broad range of disciplines. Timber management, recreation, water quality, unique plant communities, historical and archaeological sites, and data management are a few of the criteria that were studied as part of the planning process. The plan concentrates on overlaying compatible uses of the forest in as many areas as possible. The completed document facilitates sound management and decision making, and it is flexible enough to allow adaptation to the changing needs and interests of all users of the forest.

The forest provides assistantships to several students in the school each year. Some of these are associated with research, others with the day-to-day operation and management of the forest.

The Faculty

The faculty of the School of Forestry and Environmental Studies specialize in diverse areas of natural resources and the environment. They are committed to excellence in teaching and to the development of research on current environmental issues facing the nation. A favorable faculty-student ratio insures small classes, individualized instruction, and careful supervision of independent study.

Highly qualified professionals from the United States Forest Service, forestry consulting firms, and other areas of specialization serve as adjunct faculty members. Professors from the Department of Botany at Duke and the Department of City and Regional Planning at the University of North Carolina also hold joint appointments on the faculty. Scholars from foundations, private industry, and government service often visit the school to conduct conferences and symposia, to consult with faculty and students, and to teach special intensive courses.

The faculty is engaged in a dynamic program of research, much of which is oriented toward the analysis of contemporary natural resource and environmental problems. Students are encouraged to assist in these projects to involve themselves in real world situations. Some of the continuing areas of faculty research are indicated in the faculty listing at the beginning of this bulletin. Several faculty members are also involved in the development of case studies, a new approach to graduate training in resource ecology and management.

The school enjoys close relationships with other professional schools and departments within the University as well as at neighboring institutions. Duke's

departments of botany and economics, the School of Engineering, and the Institute of Policy Sciences and Public Affairs, for example, offer courses which are highly complementary to forestry and environmental studies. Faculty from these and other departments and institutions actively cooperate in research projects and sit on the graduate committees of students in the school.

The Students

A typical entering class at the School of Forestry and Environmental Studies consists of approximately sixty students from diverse backgrounds. Incoming students for the 1981-82 academic year represented many geographic areas. Twenty-seven were from the northeast United States and twenty-one were from the South. Four were from the Midwest and six from the Far West. There was one foreign student. Forty-six percent of these students were women. Ages of all students ranged from twenty to forty-five, although the majority (64 percent) were twenty-two and under. Twenty-two percent were age twenty-three to twenty-five and 14 percent were twenty-six and over.

Educational backgrounds of students entering in the fall of 1981 were equally varied. The majority (thirty-two) had undergraduate majors in the natural sciences. Seven had majored in either forestry, environmental science, or earth science. Eleven had majors in the social sciences. Eight had dual majors in science or social science and the humanities. One had an advanced degree.

Publications

The Office of Resource and Environmental Publications serves as the center for publications issued by the School of Forestry and Environmental Studies. *FOREM* (an acronym for forestry and environmental management) is a news magazine that reflects all aspects of the school's current activities and achievements, with an emphasis on research. Published three times a year, it is mailed to alumni of the school and to other individuals and organizations throughout the United States upon request. Other regular publications include announcements of intensive courses, conferences, and special programs; a student resume book; and an annual research report. Technical bulletins and conference proceedings are published as part of a continuing series.

The office is under the direction of a publications specialist. Assistantships are offered to students who have photographic, journalistic, or artistic skills.

Degrees



Degrees

Duke University offers professional and research degree programs in forestry and environmental studies. Study can be pursued for a Master of Forestry (M.F.) or Master of Environmental Management (M.E.M.) degree in the School of Forestry and Environmental Studies, or for a Master of Science, Master of Arts, or Ph.D. degree in the Department of Forestry and Environmental Studies of the Graduate School.

The degrees offered through the School of Forestry and Environmental Studies (M.F. and M.E.M.) are professional degrees. They are intended mainly to provide students with the education and experience for careers in resource management.

The Master of Forestry degree concentrates on forest and associated resources, including woodlands, water, wildlife, and recreation, and their management from an ecological and economic point of view. The graduate with an M.F. degree is qualified for employment as a professional forester in an administrative, staff, or field position with federal or state agencies, forest industries, and other organizations concerned with forest and land management. The M.E.M. considers natural resources in a broader context. The basic objective of this degree is to develop expertise in planning and administering the management of the natural environment for maximum human benefits with minimum deterioration of ecosystem stability.

Students planning careers primarily in teaching and research are urged to follow a course of study in the Graduate School. The Graduate School degrees (M.S., A.M., Ph.D.) are appropriate for the student who wishes to concentrate on a particular area of resource science or policy, with less emphasis on resource management. These degrees can be structured to include work in professional areas, but a substantial concentration in a specific area of science, systems analysis, or policy is a normal part of a graduate degree.

Requirements for the Professional Degrees

A total of 60 units is required for either the Master of Forestry (M.F.) or the Master of Environmental Management (M.E.M.) degree. Although a student may fulfill part of the degree requirements through an internship or independent study off campus, he or she must complete at least 30 units and spend a minimum of two semesters in residence.

Students' programs consist of a combination of regular courses, independent projects, and seminars. A master's project of at least 4 but not more than 8 units is



required of all students. A three-week practicum for 3 units of credit may be required in some programs of study. Practicums are offered in May, after spring semester classes have ended, and concentrate on resource study and problem analysis in various geographic regions. Course work in other departments of the University and at nearby institutions is available to strengthen students' education in special areas.

A full semester load is 15 units, which should ordinarily consist of a combination of regular courses, independent projects, and the master's project for not more than 13 units, plus 2 units of seminars. Not more than four regular courses can be taken in a semester. Permission of the dean is required to take more than 15 or fewer than 9 units in a semester.

As students progress in their programs, they are expected to devote an increasing amount of time to the master's project and to register for more independent project units in a semester. Thus, the student should plan to take fewer units of regular courses during the latter semesters of study.

CONCURRENT DEGREES

Students desiring to earn both an M.F. and an M.E.M. degree can do so by planning their courses appropriately. The requirements for earning both degrees are as follows:

1. The student must qualify for either an M.F. or M.E.M. degree under the requirements set forth above.
2. To be eligible for the second degree, the student must complete an additional 30 units of study composed of courses which would normally be accepted toward the second degree. Two semesters in residence are required. A maximum of 6 units may be allowed for equivalent graduate work done elsewhere.

Determinations of eligibility for the degrees, including allowances for work done elsewhere, will be made on individual bases only and will consider the educational background and objectives of the student.

Master of Business Administration. The techniques of management science are applied with increasing frequency in the management of natural resources, and they are also now commonly used in the analysis of environmental problems. To integrate training in these management techniques more effectively into the curriculum, the School of Forestry and Environmental Studies has developed a cooperative arrangement with Duke's Fuqua School of Business. Three years of study are required to earn the combined degrees of Master of Forestry/Master of Business Administration or Master of Environmental Management/Master of Business Administration. Degree requirements in the School of Forestry and Environmental Studies are determined by the faculty council. Normally, at least 45 units of credit within the school are required to receive the M.F. or M.E.M. degree. A typical program sequence would involve spending the first year in the School of Forestry and Environmental Studies followed by a year in the Fuqua School of Business and concluding with the final year in either school with elective work in the other.

These concurrent degrees stress concepts, analytical reasoning, and the basic methodologies of management science, while providing the student with a knowledge of current problems in the natural resource industries. Managerial economics, resource economics, organization theory and management, accounting, information and control, resource management, the legal environment, and public policy aspects of resource industries form a substantial component of each degree.

Because of the academic demands of these degrees, those entering without the necessary analytical skills or life science background may be required to take additional work beyond that specified.

Students who wish to undertake both the Master of Forestry or Master of Environmental Management and Master of Business Administration degrees must apply to and be accepted by each of the respective schools. For information on the Master of Business Administration degree, the prospective student should write to the Fuqua School of Business, Admissions Office, Duke University, Durham, North Carolina 27706.

Master of Arts in Public Policy Sciences. As issues concerning natural resources and the environment have become of increasing significance to the nation, there has developed a corresponding need for well-trained policy analysts who can provide timely and appropriate information and analysis to resource policy makers. To meet this need a unique concurrent degree has been developed in cooperation with the Institute of Policy Sciences and Public Affairs. Students pursue a Master of Forestry or Master of Environmental Management degree and a Master of Arts degree in public policy sciences. Doctoral candidates in forestry and environmental studies are also eligible to undertake the Master of Arts in public policy sciences.

The concurrent degree normally takes two and one-half years to complete. The first year is devoted to study in the School of Forestry and Environmental Studies, and the second year is spent in the Institute of Policy Sciences and Public Affairs. The final semester involves work in both areas. Degree requirements in the School of Forestry and Environmental Studies are determined by the faculty council. Normally, at least 45 units of credit within the school are required to receive the M.F. or M.E.M. degree. A summer internship with a resource or environmental agency, or with a related legislative, judicial, or interest group, is recommended.

This degree provides training in the politics and economics of resource and environmental policy making. Emphasis is placed on understanding the social and political forces involved, developing facility with quantitative and logical methods of forecasting, and evaluating policy consequences. Knowledge of the uses and limitations of policy analysis, and an awareness of the ethical dimensions of policy choice are also stressed.

Students must apply to and be accepted by both the School of Forestry and Environmental Studies and the institute. For detailed information on the policy sciences degree, write to Director of Graduate Studies, Institute of Policy Sciences and Public Affairs, Duke University, Durham, North Carolina 27706.

Degrees in the Graduate School

In addition to the professional degrees (M.F. and M.E.M.) described earlier, Duke University offers the Master of Arts (A.M.), Master of Science (M.S.), and Doctor of Philosophy (Ph.D.) degrees in appropriate areas of forestry and environmental studies. These degrees are administered by the Graduate School of the University; however, the bulk of the instruction, research, and advising connected with them takes place in the School of Forestry and Environmental Studies. For administrative purposes, qualified faculty members of the School of Forestry and Environmental Studies comprise the faculty of the Department of Forestry and Environmental Studies of the Graduate School.

Degrees in the Graduate School are appropriate for students desiring to concentrate their study and research within a well-defined area of forestry or environmental studies. Students usually pursue fewer and more advanced topics to a greater depth than do students in professional degree programs. Thus, study in the Graduate School is more appropriate for students preparing for careers in teaching or research in specialized areas, while the broader approach characterizing professional education is more appropriate for students preferring careers in resource management.

Graduate School students emphasize research as major parts of their degree programs. An active research program is a vital component of the School of Forestry and Environmental Studies, and most of the research projects in the school utilize graduate students as research assistants.

Qualification of Students. Students seeking admission to the Graduate School must have received an A.B. or B.S. degree (or the equivalent in the case of foreign students) from an accredited institution. Usually the student should have majored in the area of intended graduate study or one closely related to it. Some work in science and mathematics is essential; however, the total undergraduate education should be well-rounded. Because research is such an integral part of graduate education and of the school's mission, the student's undergraduate record must evidence the capability and motivation to carry out independent study and research at an advanced level.

Policy and Procedures. Policy and procedures for admission, general requirements for degrees, registration, and academic regulations are given in detail in the

bulletin of the Graduate School and are not repeated here. In general, procedures, requirements, and regulations are similar in the Graduate School and in the School of Forestry and Environmental Studies. Some differences are noted below.

Admission. Applications for admission to A.M., M.S., and Ph.D. degree programs in forestry and environmental studies should be obtained from and returned to the Dean of the Graduate School, Duke University, Durham, North Carolina 27706. However, inquiries about programs of study and research should be sent to the director of graduate studies, School of Forestry and Environmental Studies. On request, the director of graduate studies will arrange to have application materials sent to the applicant.

GENERAL REQUIREMENTS FOR THE MASTER'S DEGREES

Residence Requirements. Candidates for A.M. or M.S. degrees must spend, as a minimum, one full academic year (two successive semesters), or its equivalent in summer sessions, in residence at Duke University. Thirty units of graduate credit constitute minimum enrollment for a master's degree. Additional time to complete course and research requirements is frequently necessary.



Transfer of Graduate Credits. A maximum of 6 units of credit may be transferred for graduate courses completed at other institutions. Consult the bulletin of the Graduate School for details.

The Thesis. A thesis is required of A.M. and M.S. degree candidates. The thesis must indicate the student's ability to collect, arrange, interpret, and report pertinent material on a research problem. Although a publishable document is not required, the thesis must be written in an acceptable style and should exhibit the student's competence in scholarly procedures.

The Examining Committee and the Examination. The faculty member who directs the student's program recommends an examining committee composed of himself and two other members of the graduate faculty, one of whom usually must be from a department other than forestry and environmental studies. The committee conducts an examination based on the student's general program and on the thesis if one is submitted.

Language Requirements. There is no language requirement for A.M. or M.S. degree candidates in the Department of Forestry and Environmental Studies.

Major and Related Subjects. The student must present acceptable grades for a minimum of 24 units in graduate courses. Of these, at least 12 units must be in the Department of Forestry and Environmental Studies. A minimum of 6 units must be in a minor subject or in related fields approved by the department and by the dean of the Graduate School. A maximum of 6 units may be earned by submission of an approved thesis.

GENERAL REQUIREMENTS FOR THE DOCTOR OF PHILOSOPHY DEGREE

The Ph.D. is a research degree. Although course work is a necessary part of the student's program, the mere accumulation of course credits will not be sufficient for receiving the doctorate. The granting of the Ph.D. is based primarily upon the student's knowledge of a specialized field of study and upon the production of an acceptable dissertation embodying the results of original research.

Requirements. The formal requirements for the Ph.D. degree are as follows: (1) major and related courses, (2) foreign language, (3) a supervisory committee for program of study, (4) residence, (5) preliminary examination, (6) dissertation, and (7) final examination. In order to be considered for candidacy for the Ph.D. degree, the student must have passing grades in all courses and a grade of C or better on at least 9 units.

Major and Related Courses. The student's program of study demands substantial concentration on courses in the department. However, a minimum of 6 units in a related field approved by the department must be included.

Foreign Language. Ph.D. candidates in forestry and environmental studies are ordinarily expected to have a reading knowledge of one foreign language. However, on recommendation of the student's supervisory committee, knowledge of a second language may be required. In exceptional cases, the language requirement may be waived completely.

Supervisory Committee. As early in a student's course of study as is practicable, and not later than two months before the preliminary examination, the director of graduate studies will nominate for the approval of the dean a supervising committee consisting of five members, with one member designated as chairman. This committee will include at least three graduate faculty members from the department and at least one from outside the department. This committee, with all members participating, will determine the program of study and

administer the preliminary and final examinations. Successful completion of the final examination requires four affirmative votes. The final examination may be administered by four members if the representative of the related field is present.

Residence. The minimum registration requirement is 60 units of graduate credit, of which not more than 30 units may be accepted by transfer. Since a full program is 30 units per academic year, prospective Ph.D. candidates who enter with the A.B. or B.S. degree must plan to spend in residence a minimum of two academic years; if they enter with the A.M. or M.S. degree, their minimum residence is one academic year. All students must register for a full course load until they pass the preliminary examination. Those entering with undergraduate deficiencies may be required to take undergraduate courses for which they will not receive degree credit. The student's supervisory committee will determine what requirements above the minimum, if any, the student must meet.

More complete information and requirements for the preliminary examination, the dissertation, and the final examination are outlined in the bulletin of the Graduate School.

Programs of Study and Research



In the School of Forestry and Environmental Studies, maximum attention is devoted to the individual student. Emphasis is placed on maintaining the highest standards of scholarship and on relevance to contemporary needs in natural resources study and research.

The educational experience at Duke is enriched by a philosophy of interdisciplinary study that takes to full advantage the breadth of professional offerings in other schools on campus. In addition, the availability of courses at the nearby campuses of North Carolina State University and the University of North Carolina makes the Duke program uniquely strong in intellectual content. Within easy commuting distances formed by the triangle of universities is found the Research Triangle Park where major public and industry-supported research programs provide excellent opportunity for work-study internships and exposure to current topics in research.

The school emphasizes three broad conceptual areas in its instruction and research: applied resource science, resource economics and policy and quantitative methods. Regular courses, intensive courses, seminars, and special studies are offered in each of the three areas. Preparation for professional employment requires a higher degree of specialization than is characterized by this framework, however. Hence, six programs of study have been designed by the faculty to assure competence in some aspect of natural resources while offering adequate breadth of educational experience. Two of these programs, Forest Management Science and Forest Productivity, are offered under the Master of Forestry degree; the remaining four, Resource Ecology, Water and Air Resources, Land Resources, and Resource Economics and Policy, are offered under the Master of Environmental Management degree. Each program of study includes:

1. A set of required courses constituting the major,
2. A set of courses to form a minor,
3. A series of seminars relevant to program objectives,
4. Elective courses to explore other topics or improve competency,
5. A master's project compatible with program goals.

Each program can be used as a foundation for obtaining the Ph.D.

Qualified students who have interests outside of the structured programs are permitted to design individual programs of study. Pursuit of an individual program requires preparation of a comprehensive statement of objectives and specification of each of the five program components: major courses, minor courses, seminars, electives, and a master's project. All individual programs of study are subject to approval by the faculty council.

The six programs are described briefly below. Specific requirements of each program are available from the faculty council.

Forest Productivity. Forest productivity is concerned with the identification, evaluation, and selection of economically, biologically, and environmentally sound management options to increase timber production and other benefits from forest lands. The program integrates biological and physical principles, management science, and economic analysis with silvicultural techniques to enhance forest productivity. This distinctive approach is brought about by close coordination of resource inventory course work; resource-oriented courses such as soils, silviculture, timber production methods, forest protection, tree physiology and genetics; management-oriented courses such as operations research, modeling, and ecosystem analysis as applied to research and development; and research in forest productivity.

The program emphasizes the use of tree and stand growth and development models to facilitate decisions on the selection of management options to achieve objectives. Various methods of analysis are applied to all forest resources in order to optimize production within the constraints imposed by biological, physical, and economic conditions.

This area of concentration provides graduates with a variety of skills that qualify them for positions in forest products industries, government agencies, nonprofit organizations, and other groups concerned with the utilization and protection of forests. The program also provides an excellent foundation for the Ph.D. and a career in research.

Forest Management Science. The forest management science program blends the biophysical management of the forest resource with the methods and concepts of modern business administration. The program emphasizes the planning, administration, scheduling, and control of systems for the production of wood and fiber. These operations involve a substantial portion of the assets, personnel, and physical systems necessary to deliver the goods and services of a forest-based organization.

Problem solving related to timber stand manipulation, production planning, harvesting, transportation systems, facility location, manufacturing, inventory control, and related areas are at the core of the program. The student will learn to apply quantitative techniques such as computer modeling, mathematical programming, and simulation. Economics and business administration are preferred areas of study for the minor, although a set of courses in systems science is also highly suitable.

Because primary emphasis is placed on methods of problem analysis, the program is suitable for students with a wide range of career aspirations in industrial forestry or public service. Students who complete this program and also complete requirements for the Master of Business Administration degree in the Fuqua School of Business have particularly strong credentials for employment in private industry.

Resource Ecology. The resource ecology program stresses the development and application of ecological principles to solve resource and environmental problems within the constraints of economic conditions and environmental ethics. It emphasizes the use of scientifically based resource management principles to maintain ecosystem integrity and sustained yield, prevent the irreversible loss of ecosystem processes, retain option values for future generations, and derive appropriate mitigation and reclamation procedures for development activities.

The program provides a forum for cross-disciplinary approaches to applied resource problem solving. Biometeorology, hydrology, plant physiology, population ecology, the study of soils and quantitative methods are among the physical and biological sciences integrated into the program through course work and

research projects. Emphasis is placed on the analysis of factors that influence a particular resource, determination of the variables that control ecosystem processes, and simulation of organism or ecosystem response to disturbance. Example studies include environmental carrying capacity; the effects of fire, flooding, or drainage on wetlands and forests; clearcutting; inputs of toxic or hazardous substances into ecosystems; the effects of fertilization on forest systems and water resources; the effects of air pollutants on ecosystem responses; and integrated pest management in forest ecosystems.

A judicious selection of courses and an appropriate research project will give the student a strong preparation for career opportunities in applied ecology fields such as forest ecology, wetlands ecology, ecotoxicology, environmental impact analysis, and ecological consulting. Students interested in the environmental effects of hazardous substances are also encouraged to consider participation in the Integrated Toxicology Program, described in the chapter, "Alternative Educational Opportunities."

Water and Air Resources. The program in water and air resources is concerned with the management of these renewable natural resources and their interaction with land related resources. Particular emphasis is placed on the effects of land resource management on water quality and quantity and on air quality.

Majors in the program can select one of two areas of concentration: either water resources or a combination of water and air resources. Course work and other training in the program cover basic hydrologic and atmospheric processes, methods of quantitative analysis, and methods of management and decision making. The basic processes emphasized are those concerned with watershed hydrology; stream and lake water quality; general meteorology and climatology; and the origins, transport, and removal of atmospheric pollutants. Quantitative analysis techniques include statistical methods, probabilistic and deterministic models, and optimization and simulation methods. These courses are integrated with others in water resource management, air resource management, and economic analysis.

Graduates of the program acquire the skills to become analysts or consultants for private industry and public agencies concerned with the management and protection of water and air resources. These employers include regional planning agencies, public utilities, fuel and ore extraction corporations, consulting firms, and hydrologic or environmental research centers.

Land Resources. Land resources management includes conceptual and applied studies of the ecologic and economic bases for land development and protection. The program in land resources emphasizes principles and concepts relating to land ownership, systems of land tenure, land law, land taxation, resource related investments, land markets, environmental impacts of land management activities, and public policies aimed at improving resource outputs and protecting the nation's land heritage.

The curriculum in land resources reflects the legal, economic, and ecological imperatives of managing land areas such as coastal zones, flood plains, public lands, prime agricultural and forest lands, wetlands, and land affected by resource extraction. Students in the program are expected to develop strong quantitative skills which can be applied to the land management problems of individuals, private enterprises, the federal land management agencies, and state and local governments.

Course work in the program spans the natural sciences, including ecology, soils, silviculture, and ecotoxicology, and draws heavily on resource economics, environmental law, natural resources policy, and land planning.

Resource Economics and Policy. The increasing interest in wise stewardship of natural resources has created a new demand for well-trained professionals in the



economics and policy fields. A strong program of study in these areas builds upon strengths within the school, upon internationally acclaimed scholars in economics and policy sciences on the Duke campus, and upon regional, national, and international associations.

The program includes micro-, macro-, and management economics and the application of economic analysis to problems involving forest, land, water, and air resources. The management of personnel, capital, materials, and information is also considered. Students are taught to apply quantitative decision-making skills to contemporary resource and environmental issues.

Complementing the economics emphasis is an emphasis on the institutional, legal, and political aspects of natural resources policy. Courses and research efforts address the structure of natural resources policy-making organizations, both public and private, the processes for resolving policy issues, and the statutes that constitute natural resources law. The issues of public and private values, questions of who will pay and who will benefit, and the assignment of priorities for the management of scarce resources are among the topics of study.

Students in the program have the opportunity to assist in on-going research projects in the school's Center for Resource and Environmental Policy Research and the nearby Southeastern Center for Forest Economics Research. Such training provides a comprehensive background for a wide range of resource management careers.

Center for Resource and Environmental Policy Research



Acting Director

Benjamin A. Jayne, *Professor*

Faculty

Robert Boyd, *Assistant Professor*

George F. Dutrow, *Adjunct Associate Professor*

Milton T. Heath, *Adjunct Professor*

William Hyde, *Assistant Professor*

Kenneth H. Reckhow, *Assistant Professor*

Curtis J. Richardson, *Associate Professor*

Jack P. Royer, *Assistant Professor*

J. Michael Vasievich, *Adjunct Assistant Professor*

The Center. The Center for Resource and Environmental Policy Research recently established at Duke University is committed to objective and timely analyses of critical natural resource and environmental issues. Emphasis is given to land, forest, water and air resources, and to energy. The center's agenda includes problems characteristic of the managed forests of the Southeast, the coastal zone, and the recreational lands of the Appalachian region. However, the interests of the scholars and students associated with the center are not limited to the Southeast. Rather, policy issues of national, and sometimes international, flavor are the subject of investigation.

The center was developed in response to recognition of the many conflicts developing over competitive use of natural resources and consequent legislative regulation. Clearcutting of national forests, timberland taxation policy, and land use in coastal zones are indicative of the resource-environmental issues that have elicited concern.

During the past few years, a substantial and comprehensive body of legislation has been enacted to address resource and environmental problems, much of it strongly influenced by information provided by special interest groups. Often, this legislation has been drafted and passed in a quasi-crisis atmosphere with a consequent absence of mature deliberation.

Because contemporary resource-environmental problems are deeply embedded in the social, economic, and political fabric of the country, they are in need of careful and deliberate study. It is in the national interest that such issues be examined in a setting conducive to independent thought with appropriate regard for timeliness of results and conclusions. The Center for Resource and Environmental Policy Research at Duke University is designed specifically to provide the proper setting for such an approach.

Among the current research programs are:

- Land Use Planning and Rural Development;
- Energy Systems Policy;
- Policy for Resource-based Industry Development;
- Educational Research and Policy Issues;
- Policy Development and Political Feasibility;
- Water Resources Policy;
- Historical, Cultural, and Ethical Considerations in Resource and Environmental Policy;
- Resource Economics and Policy;
- Forest Planning and Protection Policy;
- Environmental Risk Analysis;
- International Resource and Environmental Policies.





The Center Organization. The center is by design and intent a flexible, multidisciplinary unit. Headed by a director and staffed by an interdisciplinary faculty, the center offers opportunities for involvement to executives, administrators, political representatives, mid-career professionals, academicians, and graduate students. A major aim is to bring together special groups of scholars and professionals to focus their attention on contemporary resource and environmental research problems.

The center is viewed as an all-campus unit at Duke University, drawing primary support from the School of Forestry and Environmental Studies while maintaining strong associations with the Schools of Law, Business Administration and Engineering, and the Institute of Policy Sciences and Public Affairs. Beyond the Duke campus, the center maintains close ties with officials from government and industry and the faculty and students of other universities, particularly the University of North Carolina and North Carolina State University. Several members of the center's faculty are allied with the Southeastern Center for Forest Economics Research. This consortium, headquartered at the Research Triangle Park, is sponsored by the United States Forest Service and several regional universities.

Graduate Study. The center provides opportunity for graduate study at the master's and doctorate level in two major areas, policy and economics, and provides minor emphasis in these same topics to students from other subject areas. Degrees are offered through the School of Forestry and Environmental Studies; in addition, concurrent degrees may be developed with the Institute of Policy Sciences and Public Affairs and with the School of Business Administration. Students interested in the degree program should contact the center director for a current course list and for formal admission.

For the student interested in a graduate research program at the M.S. or Ph.D. level, individually designed programs of study are directed by the center faculty in accordance with Graduate School policy.

The center offers graduate assistantships to qualified students in resource and environmental policy research. Support is available to students pursuing M.S., A.M., or Ph.D. degrees through the Graduate School at Duke University and M.F. or M.E.M. degrees in the School of Forestry and Environmental Studies.

Alternative Educational Opportunities



Integrated Toxicology Program

The School of Forestry and Environmental Studies houses the ecotoxicology track of Duke University's graduate program in toxicology. The Integrated Toxicology Program operates under a specific charter to develop holistic and innovative approaches to toxicology training and to provide three training tracks: (1) general toxicology, with broad training in the principles and concepts of toxicology; (2) specialized toxicology, emphasizing such areas as pulmonary toxicology or biochemical toxicology; and (3) ecotoxicology.

The study of ecotoxicology focuses on the principles and concepts of both toxicology and ecology as they relate to the release, transport, exposure, accumulation, and effects of toxics on humans and ecosystems. The curriculum is designed to teach the student the basic principles of biochemistry, physiology, toxicology, pathology, and ecology along with specific skills in ecosystem analysis, environmental health, epidemiology, statistics, and risk analysis so that he or she can design, execute, and interpret experiments in ecotoxicology.

Completion of this training program at the Ph.D. level provides career opportunities in academia, industry, and research laboratories. Master's candidates are trained for careers in industry, consulting firms, and government agencies concerned with the management of hazardous substances.

An ecotoxicology student is affiliated as a postdoctoral fellow or graduate student (Ph.D. or M.E.M.) in the School of Forestry and Environmental studies or the Duke Marine Laboratory. All students are required to complete the core sequence of the Integrated Toxicology Program and the ecotoxicology track requirements in addition to specific degree requirements.

Students seeking admission to the program as a Ph.D. candidate make initial application to the Graduate School for admission to the Department of Forestry and Environmental Studies. Candidates for the Master of Environmental Management degree apply directly to the School of Forestry and Environmental Studies. Fellowships are available to outstanding students. Further information on the program can be found in the bulletin of the Integrated Toxicology Program.

Integrated Case Studies in Natural Resource Analysis

The case study approach to graduate education affords the student an opportunity to develop analytical and management skills through a close look at problems in resource management and policy. Case studies are used in class instruction in both traditional and intensive courses in several of the school's study areas.

In addition to utilizing completed case studies as course materials, students also have the opportunity to participate in the research and preparation of new case studies. The process of case preparation brings one in contact with professionals, businessmen, and others and offers a bridge between the academic curriculum and practical experience. This experience and the contacts made in the process of case research are valuable assets in securing employment.

The case studies are termed "integrated" case studies in natural resource analysis because they result from the cooperative efforts of a team of investigators comprising resource-ecologists, -economists, and -planners, as well as political scientists, sociologists, and others. The team approach is used in recognition of the fact that the successful analysis and resolution of the nation's complex resource and environmental problems requires a holistic perspective. Optimally, this results in an exploration of the full ramifications of utilizing natural resource systems.

One objective is to disseminate results of the integrated case studies beyond the walls of the School of Forestry and Environmental Studies. User groups have ranged from federal agencies to local and regional planners. Reflecting these diverse audiences, case study formats have varied. For example, projects have resulted in color and sound 16mm films, simulation games and workshop/conferences, as well as written reports. Typical issues addressed by past case studies include highway siting, emergency hazardous waste disposal, back country management, forest management, and the development of wetlands.

Financial assistance, in the form of research assistantships, is available to qualified students for the preparation of case studies. Up to 8 units of academic credit may be earned for case study work. Arrangements are made in consultation with the student's faculty adviser and the case studies director.

Intensive Courses

Intended for both practicing professionals and advanced full-time students who are pursuing careers in resource management, policy, and environmental science, the intensive courses offer an alternative to traditional full-semester courses. The sessions are designed to allow regular students to blend theory with practical experience as well as to allow experienced professionals to update theory and methodology. Recognized subject matter specialists provide instructional resources not normally available to the University community. The result is an enriched educational experience through the exchange of ideas and information by participants of diverse backgrounds.

The intensive courses are organized into week-long modules and classes are held three or more hours a day during the week. A course consists of one, two, or three modules, each a discrete unit of study which may be taken alone for credit. In multimodule courses, however, the first week may be a prerequisite to other weeks in the series.

School of Forestry and Environmental Studies students (M.F. and M.E.M. degree candidates) earn 1 to 3 units of credit for each intensive course. Registration is limited to seven full-time students in their second year of study. Students may not register for more than two intensive courses in a semester or four intensive courses in a degree program without special permission from the dean.

Courses in the intensive course series are listed in a special section in the chapter "Courses of Instruction" in this bulletin. They also are described as part of the Senior Professional Program. A brochure containing complete information on the intensive courses to be offered during a semester may be obtained from the school office.



Internships

An internship with a public agency, a forest industry, or an environmental consulting firm can be a valuable part of graduate professional education. Candidates for either professional degree may arrange an internship of three to six months' duration. The student is required few are able to combine formal, continuous educational programs with accepting an internship and must return to the University for at least one full semester following completion. Academic credit can be earned for an internship; however, in order to receive credit, a plan of study must be prepared in advance and approved by the student's faculty adviser and the dean. The internship must contribute substantially to the educational objectives of the student. With approval, students may use a part or all of the intern experience to fulfill the master's project requirement. Further information may be obtained from the school's Office of Career Counseling and Placement.

International Studies

The School of Forestry and Environmental Studies has a history of contribution to international education and research. Graduates of the school, some of them foreign nationals, hold significant positions in many countries—in multinational corporations, United States government agencies, or resource and conservation organizations that have global responsibilities. Members of the faculty have served overseas in programs of teaching and research, in both the developed and developing parts of the world.

The contemporary need for greater attention to international studies has led the school to develop a number of professional associations and curriculum options for students who wish to combine international interests with study of natural resources and the environment. Duke University is a member of the South East Consortium for International Development, the South Atlantic States Association for Asian and African Studies, and the Organization for Tropical Studies. On campus, an active Center for International Studies provides a rich array of educational and research opportunities with global emphasis. Current work at the school includes resource conservation and utilization projects in Nepal and Sri Lanka, educational development in Saudi Arabia, study of tropical forests in Latin America, and study of United States/Canadian interdependence on natural resources. The potential for student participation in these and other projects offers educational enrichment at either minor or major concentration levels. In addition, students in the school may elect area studies or languages to further their understanding of global issues and cultures.

The school welcomes foreign students and considers an international student body of value to the learning environment. Through both formal and informal interaction, students from various cultures exchange information and opinions on resource and environmental problems and their alternative solutions. Qualified foreign students in Trinity College and in graduate and professional schools of the University are admitted to courses in the school, subject to the approval of the student's dean and the dean of the School of Forestry and Environmental Studies.

Cooperative Colleges

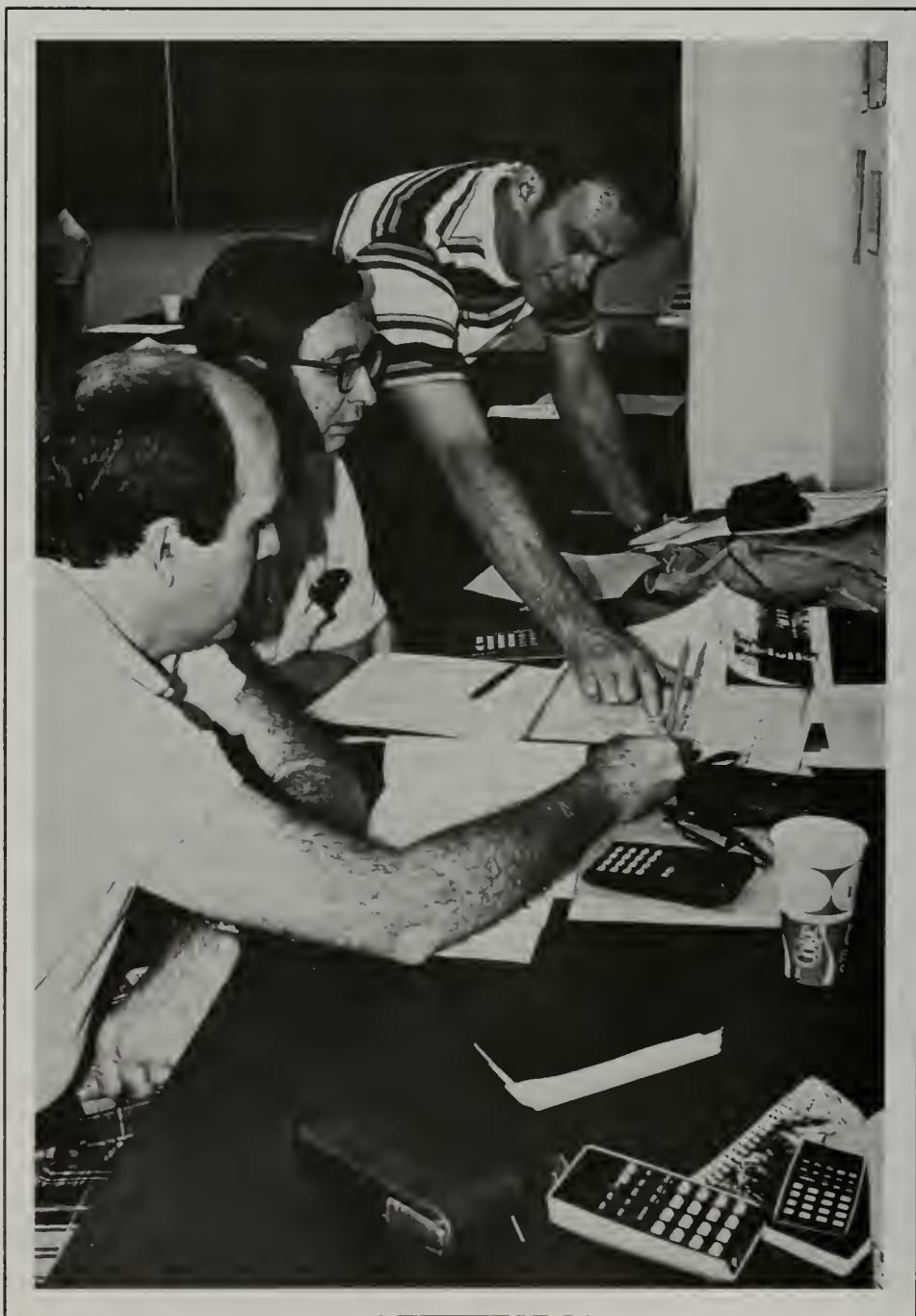
The Cooperative College Program is designed to coordinate the education of students in selected undergraduate schools with graduate programs in the broad area of resources and environment offered at Duke. Students are accepted for either of two degrees, the Master of Forestry (M.F.) or Master of Environmental Management (M.E.M.). Although the program is designed to accommodate a wide range of undergraduate backgrounds, experience of several years indicates that it is

best suited to majors in one of the natural or social sciences, pre-engineering, business, natural resources, or environmental science.

The program accepts students after three years of undergraduate study or upon completion of the baccalaureate. With appropriate guidance, highly qualified students can reach a satisfactory level of preparation for graduate work at Duke in three years of coordinated undergraduate study. The baccalaureate degree is awarded by the undergraduate school after the student has earned enough units at Duke to satisfy the requirements of the undergraduate institution. Minimum time required to complete the bachelor's degree is two full-time semesters at Duke. After four semesters at Duke, in which a minimum of 60 units of credit is earned, students may qualify for one of the professional master's degrees.

A student interested in entering the Cooperative College Program should apply to one of the participating schools. Each can provide information on courses of study and bachelor's degree requirements. Students applying for admission to Duke after the third year of study should do so early in the first semester of the third year. Students applying for admission after completion of the baccalaureate should return completed application materials by 15 February. Applicants to Duke are considered regular applicants for admission and are judged by the same criteria; therefore, students should submit application forms, transcripts, letters of recommendation, and results of the Graduate Record Examination.

Senior Professional Program



Keeping up with new knowledge presents a challenge to all professionals. For the natural resource based industries and agencies, the problems of technical change are compounded by rapidly changing social, political, and economic values. The forest resource, for example, must be managed to produce a reasonable return on investments as well as to provide a reliable source of future raw materials. The forester of today must be well-versed in the techniques of forest management and those of resource analysis to ensure financial solvency in times of increasing economic stress. An understanding of the management sciences and the concepts of operations research is also vital. Few foresters have this background, however, and few are able to combine formal, continuous educational programs with the day-to-day pressures of a career.

The School of Forestry and Environmental Studies recognizes the need for contemporary educational opportunities for professionals in the field and for efficient use of the individual's time. The Senior Professional Program is intended to provide working professionals with an opportunity to come to Duke University either to update managerial skills or to earn a professional master's degree with a minimum period of residence. The program offers symposia, managerial seminars, intensive courses, and regular University courses for qualified professionals. Fellowships-in-residence and senior internships also are available. Elements of the program may be taken for intellectual gain, for certified continuing education credit (CEU), or for graduate credit. Formal degree work may be carried out through a combination of approaches.

The Senior Professional Program allows the participant to tailor an educational experience to individual needs. A brief description of opportunities follows. Inquiries for further information may be addressed to the Office of the Dean.

Symposia and Managerial Seminars

The School of Forestry and Environmental Studies annually sponsors one- or two-day symposia and seminars. Recent sessions have dealt with alternative uses of coastal wetland ecosystems, United States and Canadian interdependence on natural resources, and data and information needs for nonindustrial private forests. Managerial seminars have covered such topics as legal problems in woodlands operations, financial accounting, and principles of taxation applied to the forest industries. Presentations at these meetings are made primarily by outside experts, with Duke faculty serving as moderators and panelists. Although participants in the symposia and seminars do not earn academic credit, they do have an excellent opportunity to meet other professionals, exchange ideas, and increase their knowledge in the area of discussion.

Intensive Courses

The cornerstone of the Senior Professional Program, the intensive courses cover a wide variety of topics focusing on the management and analysis of forest, land, and water resources. Subject matter is changed periodically in response to the needs of working professionals. Instructors are experts who have an established reputation in their respective fields. As a result, participants are exposed to up-to-date, state of the art information that is available from few other sources.

The intensive courses are structured as week-long modules in which classes meet twice a day for a minimum of fifteen lecture hours. The classes often include workshops and independent or group projects in addition to formal lectures in a classroom setting. Ample time is allowed for informal discussion with the instructor and other class members.

All professionals receive a certificate of recognition upon completion of an intensive course. Those who wish may receive certified continuing education credit (CEU) by so specifying upon registration. Participants who are admitted to the School of Forestry and Environmental Studies as candidates for the Master of Forestry or Master of Environmental Management degree may take certain intensive courses as part of degree requirements. These students may earn 1 to 3 units of credit for an intensive course.

Intensive courses are listed in a special section in the chapter "Courses of Instruction" in this bulletin. A brochure describing the Intensive Course Program, courses offered during a particular semester, registration procedures, and fees is available upon request.

Fellowships in Residence

Fellowships in residence are available through the Senior Professional Program to provide study periods of varying length on the Duke campus. Fellows may take formal courses or work on independent study projects or research under the direction of a faculty member. Graduate credit may be awarded where appropriate to fellows who are admitted to the School of Forestry and Environmental Studies as degree candidates. A limited amount of financial assistance is available.

Senior Internships

An internship may be developed to allow study in a designated corporation or agency at the administrative level. The internship is tailored to individual needs and is subject to approval by the sponsoring organization and by the school. A senior member of the host industry or agency is asked to serve as adviser to the intern and as liaison for program development and evaluation by the school. Planning, interim reports, and final reports are supervised by a member of the school faculty. Normally, the internship is a part of a graduate degree program; graduate credit may be earned.

Master's Degrees for Professionals

Qualified professionals may be admitted to the School of Forestry and Environmental Studies as part-time students. By taking a three-month leave of absence from their jobs, these professional degree candidates spend a full semester at Duke enrolled in regular, graduate level courses. Up to 15 units of academic credit are taken during this time. The remaining 15 or more units of credit needed for a Master of Forestry or Master of Environmental Management degree may be earned in absentia or on campus as career responsibilities permit. Part-time degree candidates have up to five years in which to complete all requirements.

Specific degree requirements for students in the Senior Professional Program, including required courses and the number of academic units necessary to complete the degree, are established by the faculty council upon evaluation of the individual's previous education, working experience, and career goals. A minimum of one semester in residence and 30 units of credit are required. A master's project, which may be completed in absentia, representing 4 to 8 units of credit also is required.

Applicants for degrees through the Senior Professional Program follow the same application procedures as regular students in the school. Applications must be submitted by February for the fall term and by October for the spring term. Normally, degree candidates in the Senior Professional Program take the required semester in residence during the term following admission.

Program Evaluation

An advisory board drawn from the major forest industries, consulting firms and government agencies reviews the Senior Professional Program to assure the quality and relevance of its offerings. Their recommendations help to determine intensive course content, instructor selection and qualifications, and program structure. The School of Forestry and Environmental Studies is therefore confident in offering the Senior Professional Program as an effective and economical means of educating professional resource managers without serious career disruption.

Career Counseling and Placement



Placement

The School of Forestry and Environmental Studies operates its own career planning and placement services. The facilities are available to all incoming students, graduate and professional students, and alumni of the school. Assistance is given to students in finding summer employment and internships following completion of the first year of study, permanent employment upon graduation, and mid-career changes of employment.

Career Planning Seminars. Individual career counseling and group workshops are provided by a professional career counselor to assist students in the development of job search strategies and skills, resume preparation, and interviewing techniques.

Job Search Assistance. The Office of Career Counseling and Placement maintains a current listing of employment opportunities from private industry; local, state, and federal governments; universities; and nonprofit organizations. A number of career planning and placement resource materials are housed in the office. A placement bulletin, published monthly, lists vacancies and pertinent placement information and is available to students and alumni.

A resume book is published annually by the school and distributed nationally to potential employers. Students are encouraged to prepare and submit resumes, with the assistance of the staff, for publication. Employer response to the resume book has been favorable, and many students have received initial contacts and invitations to interviews as a result.

On-campus Interviews. Each year the School of Forestry and Environmental Studies placement office, in conjunction with the Duke University Office of Placement Services, 214 Flowers Building, invites representatives from a number of firms and government agencies from throughout the country to visit the school to interview degree candidates registered with the University placement services. Students are offered an opportunity to assemble a complete dossier of academic records and recommendations to supplement applications for positions and to have a permanent file for future reference. All dossiers are kept in the University's Office of Placement Services to insure confidentiality. Students are strongly urged to begin formulating their job-hunting strategies and implementing the job search at least six months prior to graduation.

Employment Offers. The success experienced by degree candidates in securing employment serves as a strong testimony to the value of graduate/professional study at Duke. Students are encouraged to seek career-related summer employ-

ment, part-time employment and internships, and to gear their educational program to a specialized area in order to increase their employment marketability. Beginning salaries vary, depending upon the educational specialization, capabilities, and prior experience of the candidate as well as the type of organization and geographical region in which he or she is employed. For recent graduating classes, beginning salaries have ranged from \$12,000 to \$26,000 annually with candidates having some prior experience and/or advanced quantitative skills commanding the higher figures.

A survey of the 1970 to 1980 School of Forestry and Environmental Studies graduates revealed some important insights into employment patterns and labor market trends. Traditionally, the major employers of forestry graduates have been educational institutions and the United States Forest Service. Since 1970, the percentage of graduates employed with these institutions has decreased. Although some graduates still enter these fields, a far greater number now enter management, administration, or research with forest products industries or environmental consulting firms. An increasing number of graduates are becoming involved in research, planning, policy making, and management for local governments, state and county forestry commissions, natural resources departments, and federal protective agencies. Others are researchers or consultants for international organizations, public and private.

The following is a list of selected organizations with which graduates of the past several years are affiliated.



The Aerospace Corporation	National Bank of North America
Agriland Associates	National Forest Products Association
Alabama Forestry Commission	National Park Service
American Forest Institute	New Hampshire Office of State Planning
Appleton Papers, Inc.	North Carolina Department of Natural
Bartlett Tree Expert Company	Resources and Community
Battelle Columbus Laboratories	Development
Boise Cascade Corporation	North Carolina State University, Agricultural
Buckeye Cellulose Corporation	Extension Service
Champion International Corporation	Oak Ridge National Laboratories
Chesapeake and Potomac Telephone	Oklahoma Scenic River Commission
Company	Oswego County, New York, Department of
Clemson University, Department of	Planning
Recreation and Park Administration	Pacific Environmental Services
Connecticut Department of Environmental	Quinault Indian Nation, Department of
Protection	Natural Resources
Container Corporation of America	Research Triangle Institute
Crown Zellerbach Corporation	Resources for the Future
Duke University, School of Forestry and	Scott Paper Company
Environmental Studies	South Carolina Commission of Forestry
Duke University, Center for International	South Dakota Division of Conservation
Studies	TRW, Environmental Engineering Division
Environmental Research and Technology, Inc.	Union Camp Corporation
Environmental Protection Agency	United States Agency for International
GCA/Technology, Inc.	Development
Georgia-Pacific Corporation	United States Bureau of Land Management
Green Diamond Forestry Service	United States Bureau of Reclamation
INTASA, Inc.	United States Forest Service
International Paper Company	University of Florida, School of Forest
ITT Rayonier, Inc.	Resources and Conservation
Ketron, Inc.	University of Maine, School of Forest
King County, Washington	Resources
Louisiana-Pacific Corporation	WAPORA, Inc.
Maryland Department of Agriculture	Westvaco Corporation
Maryland Land Trust	West Virginia Department of Agriculture
The Mead Corporation	Weyerhaeuser Company
Montana Division of Forestry	City of Wilson, North Carolina

Admissions



The student contemplating study at Duke in natural resources and the environment can enter either the School of Forestry and Environmental Studies or the Graduate School. Admissions procedures differ somewhat depending on the choice of degrees. The professional degrees, consisting of the Master of Forestry (M.F.) and Master of Environmental Management (M.E.M.), are administered by the School of Forestry and Environmental Studies. Students wishing to earn either of these professional degrees should apply directly to the school. Those preferring to earn a Master of Science (M.S.), Master of Arts (A.M.), or Doctor of Philosophy (Ph.D.) degree should apply to the Graduate School. Students contemplating study for the Ph.D., but who are undecided at present, may find it desirable to complete one of the professional master's degrees in the school (M.F. or M.E.M.) and apply to the Graduate School for admission to the Ph.D. program at a later date.

Admission to the School of Forestry and Environmental Studies

The School of Forestry and Environmental Studies welcomes applications from men and women of all backgrounds who seek an intellectually challenging education designed to prepare them for leadership in a wide variety of natural resource and environmental positions. The programs do not require previous study in forestry or environmental studies. However, they are designed primarily for students with a degree in one of the natural or social sciences (including chemistry, biology, physics, economics, earth sciences, environmental sciences, mathematics, and political science) or a preprofessional area such as forestry, engineering, or business.

Admission is open to men and women who hold a bachelor's degree from an accredited college or university or who have completed at least three years of study in an institution participating in the Cooperative College Program. Students who do not have a bachelor's degree and are not enrolled in one of the cooperative colleges may apply to the school for special eligibility. Special eligibility is granted in a limited number of cases to individuals who can meet the school's admission criteria and who have completed the equivalent of 90 semester hours of acceptable undergraduate credit. Those interested in consideration for special eligibility must receive approval from the director of admissions before submitting an application.

Admission as a special or nondegree student may also be granted under appropriate circumstances.

Recommended Preparatory Courses. Course work in the School of Forestry and Environmental Studies is taught at a level which assumes that students have

had at least one year of biology, economics, and college-level mathematics. In addition, one course in ecology is highly desirable. Preparation in biology should include some work in botany. Courses in economics should have a significant component of microeconomics. Preparation in mathematics should include courses in statistics and calculus. Since considerable emphasis is placed on use of the computer during graduate study at Duke, course work in computer science can be valuable. Additional preparation is desirable for students entering some specific programs.

Although students without the level of preparation described above may be accepted for admission, it is expected that deficiencies will be made up prior to entrance by means of formal course work, independent study, or other arrangements agreed upon by the applicant and the school. Students will be notified upon admission of any apparent deficiencies.

Admission Criteria. Admission to the School of Forestry and Environmental Studies is highly selective. Academic performance as an undergraduate, scores on the Graduate Record Examination, and full-time work experience are the primary factors. Recommendations, the statement of educational goals, extracurricular activities, part-time and summer work experience, and other information requested on the application also provide a basis for selection.

The Admissions Committee considers each applicant as an individual. It attempts to evaluate each candidate for his or her academic potential, professional promise, and ability to benefit from and contribute to the goals of the school.

Application Procedures. Except in unusual circumstances, students are admitted only at the beginning of the fall term. Applications are accepted at any time; however, applications which include requests for financial aid must be submitted by 15 February preceding the fall in which admission is desired. Because the school processes applications from more qualified students than it can admit, early submission of applications is recommended.

Students who, because of unusual circumstances, wish to begin their studies in January should complete their application no later than 15 October prior to their matriculation. It should be noted that all financial awards are allocated to students beginning in the summer or fall, and no awards will be considered for January applicants.

Application for admission to the Master of Forestry and Master of Environmental Management degrees is made through the Office of Admissions of the School of Forestry and Environmental Studies. All correspondence should be addressed as follows: Director of Student Administrative Services, School of Forestry and Environmental Studies, Duke University, Durham, North Carolina 27706.

Each applicant must submit the following before action can be taken:

1. application form;
2. transcripts from each undergraduate and graduate school attended;
3. three letters of recommendation;
4. scores on the aptitude (verbal, quantitative, and analytical) test of the Graduate Record Examination;
5. a nonrefundable application fee of \$35.

Application Forms. No applicant will be considered until the completed application form and related documents are received by the director of admissions. The Admissions Committee attaches considerable weight to the statement of educational objectives submitted by the applicant. This statement should reflect well-defined motivation to pursue graduate study. The school is particularly interested in applicants who show leadership potential in the broad field of natural resources and the environment. Applicants are expected to demonstrate the

maturity and sense of purpose essential to a demanding educational experience, including a concept of the value of professional education to the applicant's career plans and expectations.

Transcripts. Official transcripts of all undergraduate and graduate study should be sent directly to the director of student administrative services by the registrar of each institution attended.

Letters of Recommendation. Each applicant is required to arrange for the submission of three letters of recommendation, preferably on the form supplied with the application. These recommendations provide the Admissions Committee with evaluations of the applicant's past performance in academic and employment related situations. Although recommendations from any source are acceptable, at least one job related recommendation and one from a college instructor or administrator are desirable.

Graduate Record Examinations. All applicants for degree programs must take the aptitude test (verbal, quantitative, and analytical) of the Graduate Record Examination (GRE). Although not required, applicants are encouraged to take an advanced test and submit the score as additional information for admission. The GRE is administered by the Educational Testing Service at locations throughout the world. Applicants are urged to take the exam at the earliest convenient date. Scores on tests taken later than October may not reach the school until after the 15 February deadline for application for financial aid. Scores should be reported directly to the director of student administrative services. Registration forms may be obtained by writing to GRE, Educational Testing Service, Princeton, New Jersey 08540.

Application Fee. A nonrefundable application fee of \$35 is required of all applicants. A personal check, money order, or cashier's check made payable to Duke University is acceptable. Applications will not be officially received or processed until the required fee has been paid.

Interviews. An interview with a member of the Admissions Committee, although not required, often is helpful to the applicant as well as to the school. Consequently, those applicants who can visit the school are encouraged to do so. The interview presents an excellent opportunity for the applicant to ask questions, gain insight into the school, and bring items of concern to the attention of the Admissions Committee. Applicants are encouraged to allow sufficient time to visit classes, meet students and faculty, and tour the University and Duke Forest.

In general, interviews can be scheduled on weekdays throughout the academic year. Appointments should be made at least two weeks in advance. Visits during the summer months are possible but should be scheduled well in advance.

Each year faculty or other representatives of the school travel throughout the country to visit undergraduate schools, particularly the cooperative colleges. Applicants from cooperating colleges should check with their program adviser for details of these visits. In addition, it is sometimes possible to arrange an interview with an alumnus, particularly where distance precludes travel to Durham. In all of these situations the emphasis is on exchanging information with the applicant.

For further information or to arrange an interview, applicants may write to the Office of Admissions or call (919) 684-2135.

Deferred Admission. Normally, applicants are admitted only to the class for which they have applied. However, a deferral of admission may be granted for the applicant to gain experience or to strengthen academic qualifications for graduate study or for other valid reasons. Except in unusual circumstances, a deferral of admission cannot be granted for more than one year. Deferrals are granted on individual bases. The small size of each class frequently precludes open-ended

guarantees of future admission; however, applicants with substantial reasons for deferring the start of graduate work are encouraged to send a request and a tuition deposit to the director of student administrative services as soon as possible after receiving an offer of admission.

Application Deadlines. Application forms and all other information required to complete the application and to allow a student to be considered for admission should be submitted to the Office of Admissions by 15 February for the fall term and by 15 October for the spring term. Although applications submitted after these dates may be considered, early application is recommended because the school receives applications from more qualified students than can be accommodated. All candidates should make arrangements to complete the Graduate Record Examinations well in advance of these deadlines. Applicants seeking financial assistance in the form of scholarships, fellowships, and assistantships for the fall term must have their applications completed no later than 15 February.

Response to Offer of Admission. When admission is approved, the applicant will receive an offer of admission and an acceptance form. A nonrefundable tuition deposit of \$200 is required with acceptance of the offer. The admission process is not complete until the acceptance form and the tuition deposit have been returned to the director of student administrative services.

Additional Procedures for Foreign Students. Each year the School of Forestry and Environmental Studies welcomes a number of foreign students among its professional and graduate candidates. Applicants from other countries must meet the same criteria as applicants from the United States. All academic transcripts and other documents in support of admission must be accompanied by an official translation if the original document is not in English. The nonrefundable application fee of \$35 (U.S.) must accompany the application. Applicants must



have a fluent command of oral and written English. No allowance is made for language difficulty in arranging course schedules or in evaluating performance.

If the native language is not English, the applicant must submit scores on the Test of English as a Foreign Language (TOEFL) to be considered for admission. All arrangements for taking the TOEFL must be made directly with the Educational Testing Service, Box 899, Princeton, New Jersey 08540.

All foreign students whose native language is not English will be tested during their first registration period for competence in the use of oral and written English. Until such competence is determined, admission and arrangements for an award involving teaching must remain provisional. Students found to lack necessary competence should be prepared to assume all costs for being tutored in English and should reduce their course or research program by 3 units while being tutored. Students who do not successfully pass the test for competence in the use of oral and written English by the end of their first year of residency will not be permitted to continue their graduate work at Duke University.

Foreign students are not eligible for federal or state loans. The visa-granting authority in the student's country of origin, ordinarily the United States Embassy, requires proof that sufficient funds are available to the student to cover the expenses of all academic years of study before a visa can be granted. Current immigration laws make it extremely difficult for the foreign student to find summer employment and/or permanent employment in the United States after graduation.

Admission to the Graduate School

Applications for admission to M.S., A.M., and Ph.D. degree programs in forestry and environmental studies should be obtained from and returned to the Dean of the Graduate School, Duke University, Durham, North Carolina 27706. However, initial inquiries and questions concerning fields of study are best directed to the Director of Graduate Studies, School of Forestry and Environmental Studies. In addition, prospective students are urged to write directly to professors whose research interests match their own to discuss opportunities.

School of Forestry and Environmental Studies—(area code 919) 684-2421
Dean's Office—684-2135
Graduate School—684-3913
Department of Housing Management—684-5813
Registrar—684-2813

Financial Information



Tuition and Fees*

The cost of graduate study in the School of Forestry and Environmental Studies at Duke is met primarily from income from endowment, gifts, grants, and research contracts. Substantially less than one-half of the total cost is covered by tuition. In general, the cost of a graduate education of the quality offered by Duke University is modest in comparison with that of other private institutions.

Estimated Expenses for the Academic Year. Certain basic expenditures, such as tuition and housing, are to be considered in preparing a student's budget. The following approximate costs, applicable in 1982-83, are indicative of costs that can be expected.

Tuition (\$207 per unit)	\$6,210
Student health fee (\$85 per semester)	170
Housing	1,925
Food	1,760
Books and supplies	350
Motor vehicle registration	
——automobile	20
——motorcycle	10
Optional athletic fee	50

In addition to these necessary expenses, the student will incur others which will depend to a large extent upon the tastes and habits of the individual. The average Duke student, however, can plan on a budget of approximately \$10,000 for the academic year. Travel costs, clothing purchases, and other major expenditures are to be added to this estimate. Students with families naturally will have higher expenses.

Tuition Refund Policy. Tuition refunds during the fall and spring are governed by the following policy:

1. In the event of death or a call to active duty into the armed services, tuition is refunded on a pro rata basis.
2. In all other cases of withdrawal, students or their parents may elect to have tuition charges refunded or carried forward as a credit for later study, according to the following schedule:
 - a. Withdrawal before the beginning of classes: full refund.
 - b. Withdrawal during the first or second week of classes: 80 percent.
 - c. Withdrawal during the third through fifth week: 60 percent.

*The figures contained in this section are projections and are subject to change.

- d. Withdrawal during the sixth week: 20 percent.
- e. No refunds after the sixth week.
- f. Tuition or other charges paid from grants or loans will be restored to those funds, not refunded or carried forward.

Late Registration. Students who register at a date later than that prescribed by the University must pay a fee of \$25 at the bursar's office.

Audit Fee. Students registered for a full course load may audit courses without charge. Otherwise, audit fees are \$78 per course during fall and spring and one-half of tuition during the summer.

Transcripts. Transcripts are available on request for a fee of \$2, payable in advance, for a single copy. Additional copies to the same address are fifty cents.

Housing Charges. Rent at Town House Apartments is \$1,788 per person in a two-person, two-bedroom unit. Utility charges are not included.

Modular homes rent for \$1,574 per person for a three-person, three-bedroom unit. Utilities are not included.

Central Campus Apartments rents are: \$2,774 for an efficiency; \$2,113 per person in a two-person, two-bedroom unit; and \$1,796 per person in a three-person, three-bedroom unit. Rent includes furnishings and utilities, but it does not include telephones. These rental fees are in effect for the academic year; proportional increments are charged for year-round occupancy.

Married graduate students may reserve places only in the Central Campus Apartments. Accordingly, they are given priority in these apartments and are charged by the month. The rates range from \$334 to \$501 per month, depending on apartment size and furnishings.

Housing costs are subject to change prior to any academic year. A \$50 deposit is required with all housing applications. This deposit only ensures a place on the housing waiting list and does not ensure any requested residence. The deposit is refunded if there is no room or if the applicant declines the space offered prior to 15 July.

Motor Vehicles. Motor vehicles parked on campus must be registered with the traffic office. Registration must be completed five days after operation on campus begins. The proper registration decal should be displayed on the vehicle. A registration fee of \$20 is charged for each automobile and \$10 for each motorcycle.

The following documents are required to register a vehicle: (1) valid state registration for vehicle registered, (2) valid state operator's license, and (3) satisfactory evidence of automobile liability insurance coverage with limits of at least \$10,000 per person and \$20,000 per accident for personal injuries and \$5,000 for property damage, as required by the North Carolina Motor Vehicle Law.

Optional Athletic Fee. For the optional athletic fee, the student obtains admission to all regularly scheduled University athletic contests held on the University grounds during the academic year. This fee is payable at the beginning of the fall semester.

Student Health Fee. All students are assessed a fee for the Student Health Service. For the fall and spring, the fee is \$170 (\$85 per semester). For the summer, the fee is \$24 per term.

Debts. All charges for each semester are due and payable not later than the date specified by the University. No student can complete registration or attend class until arrangements have been made with the bursar for the settlement of debts. No records are released and no student is considered by the faculty as a candidate for a degree until all debts are settled with the bursar.

Students are expected to meet academic requirements and financial obligations, as specified elsewhere in this bulletin, in order to remain in good standing. Certain non-academic rules and

regulations must be observed also. Failure to meet these requirements may result in dismissal by the appropriate officer of the University.

Tuition and Fees for the Summer Session. Tuition during the 1983 summer session is \$207 per unit (semester hour). The summer student health fee and audit fee are listed above. Further information on fees, housing, policies, and procedures related to the summer session is available from the summer session office, 121 Allen Building.

Students taking summer practicums outside the Durham area will receive information on estimated additional costs upon registration.

Financial Assistance

Financial assistance in the form of scholarships, fellowships, or assistantships is available for qualified students pursuing either the professional degrees (M.F. or M.E.M.) or the graduate degrees (A.M., M.S., or Ph.D.). The school is a participant in the Graduate and Professional Student Financial Aid Service (GAPSFAS). All scholarship and fellowship applicants must file application with GAPSFAS. Typically, a student may be offered either a scholarship or fellowship (to defray a part of the tuition) and an assistantship. Applicants may obtain a GAPSFAS form from a college or university counseling and placement center or from GAPSFAS, Box 2614, Princeton, New Jersey 08540.

Scholarships are granted from University funds which are in limited supply. Consequently, only well-qualified students can expect to receive awards. Scholarships are awarded on the basis of demonstrated outstanding academic ability and a high degree of professional promise. Most scholarship funds are awarded to students entering in the fall semester. Scholarships are nontaxable.

Fellowships are obtained from foundation grants, private industry, or individual donors. Donors of fellowship funds sometimes place restrictions on the use of the funds as well as on the amount of awards. Fellowships are awarded primarily to second- and third-year students on the basis of professional promise. Most fellowship recipients are directly involved in one of the academic programs of the school. These awards are nontaxable.

Assistantships are obtained primarily from grant and contract funds awarded to various faculty of the school. In addition, University-funded assistantships are available. Assistantships are awarded to students who have sufficient experience to contribute to one or more ongoing research programs. Assistantships at lower levels of support are awarded to first-year students whereas higher levels of assistantship support are awarded to more experienced second-year students. The Ph.D. candidate can expect to obtain financial support almost exclusively from sources external to the University. Depending on the student's work assignment, assistantships may be taxable.

In all instances, admission to the school is a prerequisite for the award of any form of assistance for the first year of study. Awards are not automatically renewed for the second year of study. Second-year awards are made on a competitive basis and students must reapply in order to be considered for an award.

SCHOLARSHIPS

University Scholarships. A limited number of scholarships are awarded each year to selected students who are pursuing either professional or graduate degrees. Awards are made on the basis of academic qualifications and professional or scientific promise. Stipends range from \$500 to \$3,000 for the academic year.

FELLOWSHIPS

Boise Cascade Fellowship. Fellowships are awarded each year to selected students who are pursuing a Master of Forestry degree. Stipends range up to \$1,500 per year.

Champion International Foundation Fellowship. Fellowships are awarded each year to selected students who are pursuing a Master of Forestry degree. Stipends range up to \$1,500 per year.

Daniel H. Gelbert and Associates Consulting Forestry Fellowship. A fellowship is awarded each year to a selected master's or Ph.D. degree candidate interested in the study of nonindustrial private timber holdings. The stipend is set at \$2,000 per year.

Forestry and Environmental Studies Alumni Association Fellowship. A fellowship is awarded to a selected student who is pursuing a Master of Forestry or a Master of Environmental Management degree. The student must have completed one year of graduate study. The amount of the fellowship is set at \$1,000 per year.

Leroy B. George Fellowship. A fellowship is awarded each year to a selected student from the Haywood or Buncombe counties or the Hendersonville, North Carolina, school systems. Second preference is given to a student from the southern Appalachian region. If a qualified student cannot be identified within the region the fellowship may be awarded to a student in the school who has a demonstrated interest in resource and environmental education and planning. The amount of the fellowship is set at \$1,000 per year.

ITT Rayonier Foundation Fellowship. Fellowships are awarded each year to selected students who are pursuing a Master of Forestry degree. Stipends range up to \$1,500 per year.

Simpson Timber Company Fellowship. A fellowship is awarded each year to a selected student who is pursuing a Master of Forestry degree. Stipends range up to \$1,000 per year.

Southwest Forest Industries Fellowship. Fellowships are awarded each year to students pursuing a Master of Forestry degree. Stipends range up to \$1,500 per year.

Union Camp Foundation Fellowship. Fellowships are awarded each year to selected students who are pursuing a master's degree in the Center for Resource and Environmental Policy Research. Stipends range up to \$1,500 per year.

Weyerhaeuser Foundation Fellowship. A fellowship is awarded to a selected woman or minority student interested in a career in industrial forestry. The stipend is set at \$3,500.

ASSISTANTSHIPS

Graduate Assistantships for the Master's Candidate. Available to both professional and graduate students, these assistantships are particularly suited to the student who is interested in working up to half time during the academic year and full time during the summer. Student assistants are employed to assist members of the faculty with their research and teaching, to assist members of the school staff, and to perform a variety of other functions such as gathering and assembling data on Duke Forest. A few assistantships are available for independent research on various grants and contracts of the school. By the nature of their academic program, particularly of the master's project, some students are able to combine academic study with employment as a graduate assistant.

Graduate assistants are required to work 300, 450 or 600 hours during the academic year. Those employed for 300 hours can expect to work approximately 10 hours per week allowing for University vacation periods. Those employed for 450 hours of service can expect to work approximately 15 hours per week, and those employed for 600 hours can expect to work for approximately 20 hours per week. All levels of service require a regular schedule to be arranged between the student and the faculty member to whom he or she is assigned.

Students employed for ten hours per week are limited to 15 units of credit per semester. Those employed for fifteen hours per week are limited to 12 units of credit, and those employed for twenty hours per week are limited to 9 units of credit per semester. Exceptions require the approval of the student's adviser and the dean. Only those students involved in research for their assistantship and those students involved in independent study or a master's project which is based on the research can expect to maintain an academic load in excess of 9 units.

Stipends for graduate assistantships requiring 300 hours of service range from \$1,500 to \$1,800 depending on the qualification and experience of the applicant. Students employed for 450 hours may earn from \$2,250 to \$2,700. Students working 20 hours per week may earn from \$3,000 to \$3,600. Depending on the nature of the work assignment, all or a part of the amount may be taxable.

A few graduate assistantships are available during the summer for research and teaching. Up to full-time employment of forty hours per week for a maximum of fifteen weeks is possible. Stipends range from \$1,500 to \$3,600, depending on qualifications and experience.

Graduate Assistantships for the Ph.D. Candidate. Students who are pursuing the Ph.D. are normally retained on half-time service (1,200 hours) to the school during the calendar year. Graduate assistants are required to give 20 hours of service per week during the academic year and 40 hours of service per week for fifteen weeks during the summer for a total of 1,200 hours.

Typically, the Ph.D. candidate is assigned to a member of the faculty to work on a particular research project under his or her direction and/or to provide teaching assistance. Furthermore, the research undertaken is normally a part of the student's graduate program and serves as a basis for the doctoral dissertation. With few exceptions, assistantships are available only for the first two years of graduate study.

Graduate assistants are required to maintain a regular schedule of work as determined by the faculty member to whom each is assigned. Those accepting graduate assistantships will be limited to 10 units of course work per semester. Exceptions require the approval of the major professor and the dean.

Stipends for graduate assistants range from \$6,000 to \$8,000 for a calendar year of service (1,200 hours). Normally, only a small part of the stipend is taxable.

Research Assistantships. Funded from grant and contract research under the direction of various members of the faculty, research assistantships provide support during the latter stages of study of the Ph.D. candidate. Typically, the research assistant completes one or more phases of a research project under the direction of the principal investigator, a member of the faculty. Normally, the research completed forms a substantial component of the requirements of the Ph.D. dissertation. However, in some instances this may not be the case and the students pursue dissertation research in a related area of study.

The level of service required of research assistants depends primarily on the nature of a particular research project and the availability of funds. Normally, research assistants are committed to 600 hours of service during the academic year (20 hours per week). Almost all research assistantships require full-time service for fifteen weeks during the summer. A regular schedule of research under the direction of the principal investigator must be maintained and the academic load is

limited to a maximum of 9 units per semester. The research assistant who is retained for half-time service during the academic year and full-time service during the summer may earn from \$6,000 to \$8,000. Usually only a small part of the award is taxable.

Work/Study. Work/study funds are administered for student employment through the dean's office as assistantships. Students in the school are not eligible for work/study jobs administered through the University's placement office and are not awarded work/study funds in financial aid packages. Students who anticipate the need for a work/study position should complete the GAPS FAS form at the time they accept admission. Jobs are granted to those with established need and with the skill or training required by a professor for a particular type of teaching or research or by a staff member for a particular type of work. It is the responsibility of the student to inquire about jobs with individual faculty or staff and with the dean of the school.

Application for Awards for the Entering Student. Application for awards may be made concurrently with the application for admission. Applicants should initiate the necessary action early to ensure that the required documents are filed with the dean of the school on or before 15 February prior to enrollment. Applicants should:

1. Complete the Graduate and Professional School Financial Aid Service (GAPS FAS) form, sent on request.
2. Furnish the following documents: (a) official transcripts of all previous college or university credits earned, (b) letters of reference from at least three persons familiar with the applicant's character, scholarship, and professional ability, and (c) scores from the aptitude test of the Graduate Record Examinations. Applicants should plan to take this examination in October at the latest. Documents offered in support of admission, if so designated, may also serve in support of the application for financial award.

Notification and Acceptance of Awards. Recipients of awards are notified in mid-March. Completed applications received after the 15 February deadline will be considered if vacancies occur at a later date.

Scholarships, fellowships, and the various categories of assistantships provide the basis for professional/graduate student support. Once offered by the University or the school, funds are committed to one student and are therefore unavailable to others. *As a consequence, it is the policy of the school that all awards offered can be declined prior to 1 April without prejudice. However, offers accepted and left in effect after 1 April are binding for both the student and the school.*

Loans

Applications for loans will be considered after admission and scholarship decisions have been completed. New borrowers must first apply for loans through their state agency or local bank before other types of loans will be considered. The school also participates in the Federally Insured Student Loan (FISL) and National Direct Student Loan (NDSL) programs. Approval of loan requests for monies administered by Duke University is based on financial need and satisfactory scholastic standing. The school will make the decision on the type of loan the student receives—FISL or NDSL.

Applicants for all loans certified or administered by Duke University are required to file the form of the Graduate and Professional School Financial Aid Service (GAPS FAS). Information and application material for GAPS FAS can be obtained by writing to Educational Testing Service, Box 944, Princeton, New Jersey 08540.

Applications and complete details regarding the loan programs can be obtained by writing to the school. All applications for loans should be made before 1 July preceding the academic year in which the student plans to matriculate.

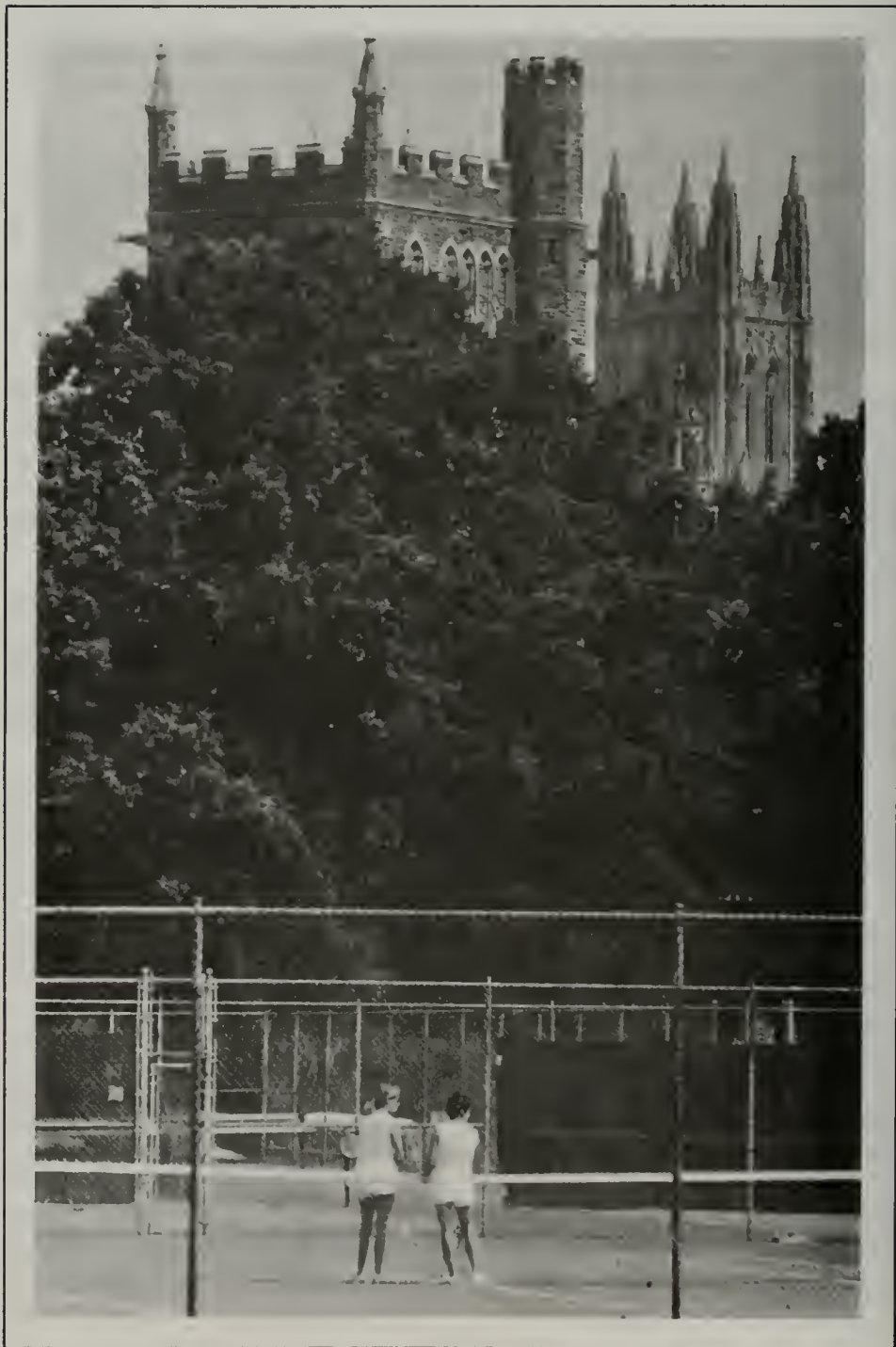
State Guaranteed Loans. Most states have established guaranteed loan programs for their own residents. The terms of such loans, the methods of administration, and the availability of funds vary widely among the states. The school will supply information regarding the appropriate agencies to contact in each state and will also make the appropriate certifications of individuals applying for state guaranteed loans. Students requesting such certification must submit the GAPSFAS form.

Federally Insured Student Loan Program (FISL). A graduate student may borrow up to \$5,000 per year to a maximum of \$25,000, including amounts borrowed during the student's undergraduate years. The interest rate is 9 percent, but the student may qualify for an interest subsidy while still in school through determination of need on the GAPSFAS report. Six months after graduation or withdrawal from the University, interest and principal payments begin. The student has up to ten years for repayment. In order to be considered for a Federally Insured Student Loan, the FISL application should be completed.

National Direct Student Loan Program (NDSL). Loans through the National Direct Student Loan Program are administered by the University. The funds are allocated to the University under strict federal guidelines on parental income, reasonableness of budget, complete disclosure of assets, and independent status of the student. GAPSFAS must be submitted. Application may be made for up to \$5,000. Interest on these loans begins to accrue at 7 percent six months after the student graduates or withdraws and repayment begins one month later with up to ten years to repay.

Short-Term Loans. Short-term loans and emergency funds are available through the Champion Paper Foundation Fund, the E. S. Harrar Fund, the Forestry School Loan Fund, and the University's General Loan Fund. These funding arrangements carry a 9 to 16 percent interest rate. Application for a loan is made at the dean's office. The funds are disbursed by the Student Loan Office on East Campus, which also arranges terms for repayment.

Student Life



Off-Campus Housing

Most of the students at the school join the annual scramble to find a place to live off campus. About one-sixth live in on-campus apartment complexes owned by the University and in the graduate residence halls.

The University is very much a part of the urban environment that is Durham, but the campus is not an urban one. It is not traversed by streets with housing and businesses. Consequently the perimeter of the West Campus is densely developed with apartment complexes, and the East Campus is adjacent to a neighborhood of large early twentieth-century homes, some of which have been converted to apartments. Free bus service is available between the two campuses.

In August and early September, the Department of Housing Management operates an off-campus housing service which consists of a staff person who maintains listings of apartment openings, house rentals, and "roommates wanted." The off-campus housing service does not rate the quality of apartments, houses, or landlords, nor arrange viewings.

University Housing

Town House Apartments. Town House Apartments is a thirty-two-unit complex of one- and two-bedroom apartments which houses single graduate and professional students. The complex is situated between the East and West campuses. Some of the apartments are furnished for occupancy by two single students and the remainder for three single students with two students sharing the large bedroom. Town House Apartments have one and a half baths, a living room, and kitchen with dining area. Students must arrange for and pay for electricity, gas, and telephone. The complex is air conditioned and has a swimming pool, and is easily accessible to the campus bus line. These apartments are available for continuous occupancy, summer months included, if desired.

Central Campus Apartments. In 1974 the University opened a 500-unit complex, the Central Campus Apartments. Units are available for single and married students. For single students, fully furnished one-, two-, and three-bedroom units are available. Apartments for married students include a few furnished efficiencies and one-, two-, and three-bedroom unfurnished units or units in which the living room and first bedroom are furnished. Married graduate students are given priority in these apartments. Because of this and an expected turnover of about 25 percent annually, not all applicants may be accommodated at the time they desire. These units are available for continuous occupancy, summer months included, if desired.



Modular Homes. The University owns six modular homes which are located between East and West campuses. They are reserved for single students. These three-bedroom homes are equipped for three-person occupancy and have proved to be popular. They are usually reserved by students who have occupied other University accommodations during the previous academic year. Students arrange for and pay for electricity and phone.

Application and Residential Deposit. Application forms, housing information, and regulations governing the occupancy of rooms and apartments will be mailed when the Graduate School or School of Forestry and Environmental Studies has notified the Department of Housing Management of official acceptance of the student.

A residential deposit of \$50 must accompany the application form but does not guarantee a space. This deposit is held throughout the term of the original occupancy and any subsequent renewal. In addition to the \$50 residential deposit, a student currently residing in University housing and desiring to reserve accommodations for the next academic year or a shorter period must make a \$50 prepayment of housing fees to the Office of the Bursar. The bursar's receipt must be presented to the Department of Housing Management at the time the application is made. This prepayment is refundable if a student withdraws from the University; has an approved leave of absence prior to 15 August and notifies the Department of Housing Management at that time; or cancels the application on or before 15 July.

Housing fees for single students are payable for an entire semester unless special arrangements to pay on a different basis are made with the University

bursar. Married students may make monthly payments as required by the terms of the lease. Housing costs are listed in the Financial Information section.

Additional payments above the rates for the academic year are required for students who must arrive earlier than the dates established for occupancy or remain later than the dates established for vacating University housing.

Roommate matching is done by the Department of Housing Management on the basis of several questions on the application form. Appeals for changing roommates are accommodated at the conclusion of a semester.

Services for Students

Medical Care. The main components of the student health service include the University Health Services Clinic, located in the Pickens Building on West Campus, and the University Infirmary on the East Campus. Emergency transportation, if required, can be obtained from the Duke campus police. The facilities of the University Health Services Clinic are available during both regular and summer sessions to all full-time students. The facilities of the University Infirmary are available only from the opening of the University in the fall until graduation day in the spring to all currently enrolled full-time students.

To secure the benefits of the student health service, a graduate student, during the term or semester in which the illness occurs, must (1) in the summer session term be registered for at least 1 unit of research or 3 units of course work; (2) be registered for at least 9 units per semester. The costs of student health benefits have been borne by tuition in the past, but are now separate and can be identified as a medical expense for tax purposes. The student health fee is nonrefundable after the first day of classes. Students are not covered during vacations, and their dependents and members of their family are not covered at any time.

The resources of the Medical Center are available to all students and their spouses and children. Charges for all services received from the Medical Center are the responsibility of the student.

The University has an Accident and Sickness Insurance Plan available for full-time students. Although participation in this plan is voluntary, the University expects all graduate students to be financially responsible for medical expenses above those covered by the student health service. Students who have medical insurance or wish to accept the financial responsibility for any medical expense may elect not to join the Accident and Sickness Insurance Plan by signing a



statement to this effect. Each full-time student in residence must purchase this student health insurance or indicate the alternative arrangement.

The Student Accident and Sickness Insurance Plan provides protection twenty-four hours a day during the twelve-month term of the policy. Students are covered on and off the campus, at home, while traveling, and during interim vacation periods. For additional fees a student may obtain coverage for a spouse or spouse and children. Term of the policy is from opening day in the fall. Coverage and services are subject to change as deemed necessary by the University.

Counseling and Psychological Services. CAPS provides a comprehensive range of counseling and psychological services to assist and promote the personal growth and development of Duke students. The professional staff is composed of clinical social workers, psychologists, and psychiatrists experienced in working with young adults. Among services provided are personal, social, academic, and career counseling. A number of short-term seminars or groups focusing on skills development and special interests such as coping with stress and tension, fostering assertiveness, enriching couples communication, and dealing with separation and divorce are also offered. A policy of strict confidentiality is maintained concerning information about each student's contact with the CAPS staff. Individual evaluation and brief counseling/therapy as well as career and skills development seminars are covered by student health fees. There are no additional charges to the student for these services.

Appointments may be made by calling 684-5100 or visiting CAPS, 214 Old Chemistry Building.

Office of Placement Services. The Office of Placement Services, 214 Flowers, acts as a liaison between the University and potential employers. Students who wish to register with the office are offered an opportunity to assemble a dossier of academic records and recommendations in preparation for interviews and to have a permanent file for future reference. Interviews with representatives from industry and government are scheduled throughout the year for those students who have registered with the placement office. All services are offered without charge to students and alumni. In addition, the school maintains its own Office of Career Counseling and Placement, 207 Biological Sciences. For further information, see the Placement section in this bulletin.

International Adviser. The International Office handles governmental matters for students from abroad such as statements of attendance for home governments, issuance of United States immigration forms for re-entry into the country after a temporary absence, and required yearly extensions of time. Any new student who is not a citizen of the United States should report with passport to the international adviser soon after arrival. The International Office is located on East Campus, 210-A East Duke.

Other Services. The Bryan University Center houses an information desk, two drama theaters, a film theater, stores for books and supplies, meeting rooms, lounges, snack bars, and other facilities. A barbershop, hairdresser, post office, and bank are also located in the center and in the nearby West Campus Union.

Student Organizations and Activities

Sports. Students are welcome to use such recreational facilities as the swimming pools, tennis courts, golf course, track, jogging course, handball and squash courts, gymnasium, weight room, and playing fields. Intramural programs provide an opportunity to participate in informal and competitive physical activity. A variety of clubs for gymnastics, scuba diving, sailing, cycling, badminton, karate, rugby, soccer, and crew are also active.

FOREM. The FOREM Club is the student organization for coordination of the school's social functions and intramural team participation. Annual functions of the club include a Christmas party, Christmas tree sale, Field Day, and year-end banquet.

Student Advisory Committee. The Student Advisory Committee, an elected student group, meets regularly with the dean and faculty representatives to offer advice on courses and curriculum, programs, and long-range goals of the school.

Professional and Scientific Societies. Students are encouraged to participate in one or more professional or learned societies appropriate to their academic interest. Most of these societies are highly interested in participation by students. Not infrequently a lower fee is established to encourage student membership. Some learned societies which might be considered for membership include American Association for the Advancement of Science, American Institute of Biological Sciences, American Economics Association, American Meteorological Society, American Phytopathological Society, American Society of Plant Physiologists, American Statistical Association, Ecological Society of America, and the Entomological Society of America. The Society of American Foresters, American Institute of Planners, the American Fisheries Society, and the Range Society are examples of typical professional societies which students might consider for membership.

Religious Services. Interdenominational services are conducted on Sunday mornings in Duke Chapel. Roman Catholic masses are offered daily on campus. Several Protestant denominations have student centers on campus. The Divinity School conducts other chapel services and religious and social activities. There is also a Hillel group which meets regularly.

Cultural Activities. Concerts, recitals, lectures, plays, films, and dance programs are presented frequently on campus. Information on major events is available at Page Box Office or the Bryan Center information desk. The University Museum of Art, which has some excellent permanent collections, is located on East Campus.

Academic Regulations



Planning

The responsibility for the specific content of the academic plan of study rests with the student. A thorough familiarity with and understanding of the regulations contained in this bulletin as well as other sources provided by the school are essential to sound planning.

During the fall term each student is assigned a permanent faculty adviser. The adviser should be consulted in planning a course of study. Other members of the faculty, particularly those concerned with the plan of study, should also be consulted on an informal basis. Reassignment to another adviser can be obtained, but only by written request to the dean.

Registration

Entering students who register for the Master of Forestry or Master of Environmental Management degree will receive instructions by mail from the School of Forestry and Environmental Studies a few weeks before the start of the fall term. Registration should be completed during the orientation week. Students in residence register for succeeding semesters at times scheduled in the University calendar.

Registration is approved by the adviser and processed by the school's director of student administrative services and by the University bursar. Registration is required in order to take courses for credit or audit. To establish eligibility for University housing, for University loans and some outside loans, for the student health service, and for study and laboratory space, a student must be registered. All tuition and fee payments and any indebtedness must be settled before registration will be completed.

Late Registration. All students should register at the times specified by the University. The charge for late registration is \$25.

Change of Registration. With approval of the adviser, the student can change registration for a period of ten days following the close of registration. A change of fees requires completion of a new fee sheet which is obtained from the school. *All changes of fees must be made on the first day of the ten-day change period.*

Refunds. Tuition refunds are governed by the policy stated in the chapter on Financial Information.

Graduate School Registration. Students in A.M., M.S., or Ph.D. degree programs register through the director of graduate studies of the Department of

Forestry and Environmental Studies. Registration requirements and procedures are described in the section on graduate degrees of this bulletin and in the bulletin of the Graduate School.

Reciprocal Agreements. Students enrolled in the School of Forestry and Environmental Studies or in the Graduate School during the regular academic year, and paying full tuition and fees, may be admitted to a maximum of two courses per semester at the University of North Carolina in Chapel Hill, North Carolina State University in Raleigh, or North Carolina Central University in Durham. Similarly, graduate students in these schools may take up to two courses per semester at Duke.

Courses

Course Descriptions. Course descriptions are listed in the final section of this bulletin. Typical intensive courses offered in recent years are listed under the section, Continuing Education for Professionals. Both sets of offerings change from time to time as emphases change. A list of courses to be offered during a particular term is available from the recorder prior to registration for that term. Schedules of courses available in other departments at Duke and at neighboring universities are also available.

Independent Study. All students are expected to place increasing emphasis on independent study as they near completion of residence. FES 299 lists a number of independent project areas. Several students can work together under the supervision of a faculty member by registering for FES 202.

Master's Project. All students must complete a master's project of 4 to 8 credits. The project should be identified during the first term of study and initiated during the second term. No student will be permitted to register for the third term of study until a project proposal has been approved by the student's adviser and has been received in the dean's office. During the final two terms major emphasis should be placed on the project. In completing the project, the student applies theoretical and analytical training acquired during the two years of study on actual natural resource or environmental problems. If desirable, arrangements can be made by the student or the school for consultation with other organizations concerning the scope and objectives of the project.

Students maintain close contact with their advisers during the development and writing of the master's project. Projects should reach final stages of completion by midterm of the final semester in residence. *One copy of the project, approved by the adviser, must be delivered to the dean's office by 1 November for those graduating in December, by 1 April for those graduating in May, and by 1 August for those graduating in September.* The adviser is responsible for critical assessment and grading.

Auditing. Students registered for a full course load may audit courses free of charge. Otherwise, the audit fee is \$78 per course during the fall and spring and one-half of tuition during the summer. Written permission of the instructor prior to registration for the course is required. Audited courses must be so indicated on the registration card. In classes where enrollment is limited, students enrolled for credit will receive priority. Audited courses are recorded without grade on the student's permanent record card. Regular attendance is expected. Changes from audit to credit are not permitted after the drop/add period.

Dropping and Adding. The period for dropping and adding courses is limited to the first ten calendar days of the semester. Students are advised to make all class changes on the first day of class if at all possible. *Except under unusual circumstances, and with special permission of the dean, no reduction of tuition and fees is permitted unless classes are dropped on the first day of the drop/add period.*

For the special intensive courses, registration may be changed from one intensive course to another course of equal credit after the close of the drop/add period. However, there may be no change in the number of semester hours or in fees.

Retaking Courses. Courses required as a part of the program elected by the student or required by the adviser must be retaken if failed. Courses prerequisite to more advanced courses the student wishes to elect must be retaken if failed. Elective courses may be retaken if the student wishes to do so. See the section on grades, below, for additional information.

Credit Hours

Students are considered fully registered when they enroll for the number of credits their programs require. Required registration is set in consideration of the student's obligation to teach or assist and of the student's progress toward fulfilling degree requirements. In the academic year, maximum registration for the resident student who does not hold an appointment as a graduate or research assistant and does not engage in part-time work is 15 units a semester or 30 units an academic year. The registration for resident students who hold such appointments or undertake such work is either 12 or 9 units, depending on the number of hours per week they are required to devote to such duties.

A full semester load of 15 units normally consists of a combination of regular courses, independent projects, and the master's project for not more than 13 units, plus 2 units of seminars or modular courses. No more than four regular courses can be taken in a semester. Permission of the dean is required to take more than 15 or less than 9 units in a semester.

A resident student who has completed all requirements except the master's project must register for 3 units of study each semester during the regular academic year until completion of the degree. Exceptions require special permission from the dean.

Transfer Credit. Students enrolled in a full-time degree program may transfer up to 6 units of credit completed in a graduate degree program at an institution other than Duke University or one of the Research Triangle reciprocal agreement universities. The credits must be upper division or graduate level course work with a grade of at least G or equivalent. A transcript must be sent to the school with a request to the dean for transfer credit.

Summer Registration. Students who are in residence during the academic year and wish to continue to study and to use University facilities during the summer, including the student health service, must register for 1 unit in the first summer session term. This registration provides use of facilities for all three terms of the summer session.

Registration in Absentia. A student who decides to go out of residence (away from the University) registers for 1 unit in absentia. This provides for occasional consultation with the master's project supervisor. It may be waived for serious problems of health.

Withdrawal. A student may withdraw from the University under special circumstances if a written petition to do so is accepted by the dean. The petition must state the reasons for withdrawal and the time of projected departure from the University.

Grades

The grading system used in the School of Forestry and Environmental Studies and the Graduate School is as follows: *E* (exceptional); *G* (good); *S* (satisfactory); *F* (failing); *I* (incomplete); *Z* (continuing).

The grades of *P* (pass) and *F* (fail) are used in the School of Forestry and Environmental Studies for seminars and modular courses. At the instructor's option, the grades of *P* or *F* or regular letter grades are used for intensive courses, independent projects, and master's projects. The grade of *Z* is assigned for an independent project or a master's project which extends over a period of more than one semester; a final grade is given upon completion of the project. Credit hours for a course completed on a pass/fail basis are creditable toward the master's degree as long as the course is not required in the student's major area of study. Permission for the pass/fail option must be obtained in writing from the instructor upon registration for a course.

Incomplete Grades. A grade of *I* indicates that some portion of the student's work is lacking, for an acceptable reason, at the time grades are reported. Requirements of all courses in which a grade of Incomplete is assigned by an instructor must be fulfilled within one calendar year following the date of the assignment of the incomplete grade. If the student fails to complete the requirements within one calendar year, the *I* grade will be changed to a grade of *F*.

In exceptional circumstances, upon recommendation of the professor who assigned the grade of Incomplete, the faculty council may extend the time for completion of the course requirements. If, in the judgment of the professor and the student's adviser, completion of the requirements is not a reasonable alternative for the student, the student may petition the faculty council to allow the grade of *I* to stand permanently on his or her record. Action to allow the *I* to stand permanently must be initiated prior to the time that a grade of *F* is recorded (i.e., within one calendar year). No student will be allowed to graduate with an Incomplete unless permission has been granted for it to stand permanently on the record.

Academic Honors. A student who is registered for at least 9 units and who achieves a superior academic record consisting of all *Es* is eligible to be named to the dean's honor list for that semester. Students who have achieved a superior academic record for all courses taken in residence may be eligible for graduation with honors or with highest honors. Faculty approval is necessary for graduation with honors. Factors considered in addition to academic achievement are professional promise, participation in student and academic extracurricular affairs, and the quality of the master's project.

Failure. Any course for which a failing grade is received must be retaken or replaced with a substitute course. A substitute course requires the approval of the student's adviser and the faculty council. Both the original failing grade and the grade received for the retaken or substitute course will appear on the student's transcript. Failure of a course also subjects the student to dismissal (see the sections on probation and dismissal and automatic dismissal).

Probation and Dismissal. Students are subject to dismissal from the school under any one or a combination of the following factors:

1. no grades higher than *S* during the first semester of study;
2. less than 6 units of *G* and/or *E* grades during the first full year of study;
3. a grade of *F* in any course at any time.

An appeal may be submitted through the adviser to the faculty to continue study under a probationary status. Probationary terms, set by the adviser, must be specific in the appeal and the appeal must be approved by the faculty. If probationary terms are met, the student will be returned to regular status. If probationary terms are not met, the student will be dismissed. Students will not be awarded degrees while on probationary status.

Automatic Dismissal. A student is automatically dismissed upon failure of more than one course.

Academic Irregularities

All cases falling outside the regular policies and procedures of the school are referred to the faculty council for decision. The work of the council includes review and decision regarding course requirements for graduation, student probation and withdrawal, student petitions for waivers of degree requirements, and all actions which deviate from established academic regulations.

A student who desires to petition the council should do so in writing to the chairman. A precise statement of the reason for the request is required. The student will be notified in writing of the decision of the council by the chairman.

Transcripts of Credit

A student who is registered for a course and who successfully completes the requirements as prescribed by the instructor receives credit on the records of the school. Official transcripts of credit are issued only by the University Registrar, 103 Allen Building. Requests for transcripts, sent directly to the registrar, should state clearly the full name under which the work was taken, the dates of attendance, and to whom the transcripts are to be sent. The student must sign the request for release of a transcript. The cost of a single transcript is \$2, payable in advance. Additional copies to the same address are 50¢ each. No transcripts will be issued for students who fail to clear all financial obligations to the University upon graduation.

Length of Study

For a full-time student entering without an undergraduate degree in forestry or environmental studies, the normal time for completing the master's degree is four semesters. A summer session may also be required in some program areas. No student, either full-time or part-time, is allowed more than five years to complete the requirements for the master's degree.

Application for the Degree

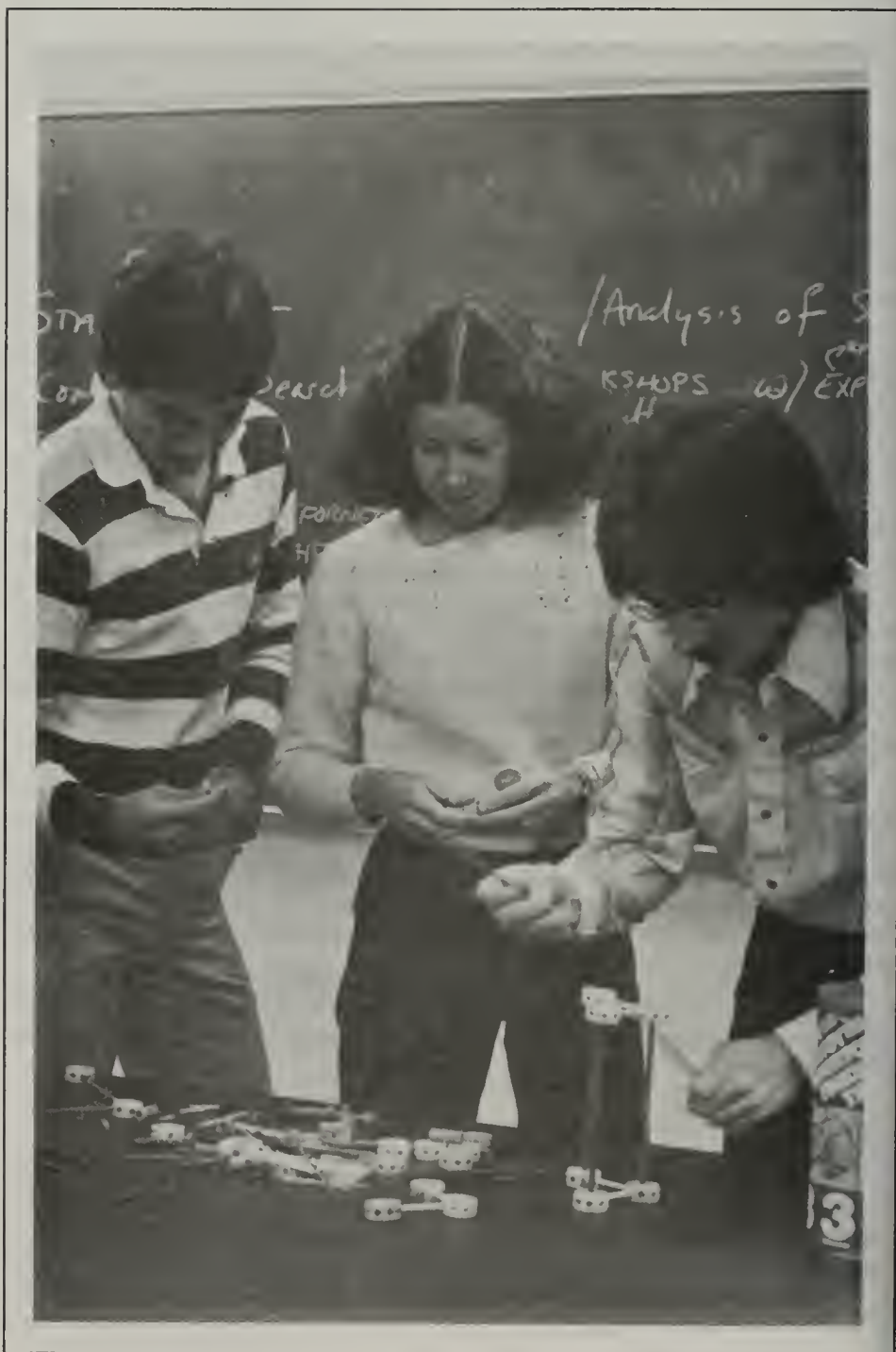
Even if degree plans are tentative, a candidate for a degree must file an application for the degree no later than the end of the sixth week of the semester in which the degree is to be received. For a degree to be awarded in September, application must be filed no later than the beginning of the second summer session. The application for the degree is valid only for the semester in which it is filed. If the student does not receive the degree as expected, he or she must file a new application.

All candidates are urged to attend the commencement exercises at which their degrees are to be awarded. A student who is unable to attend is required to file a petition with the dean, not later than four weeks prior to commencement, seeking permission to receive the degree in absentia.

Debts

Students who have borrowed funds from the school or the University to meet educational expenses are expected to settle all debts prior to completion of the degree. No records are released and no student is considered as a candidate for a degree until all debts are settled. Failure to pay all University charges on or before the times specified by the University will bar the student from class attendance until the account is settled in full.

Courses of Instruction



191, 192. Independent Study in Forestry and Environmental Studies.

Directed reading and research. Open to qualified students in junior and senior years by consent of the student's department in Trinity College and of the School of Forestry and Environmental Studies. Units to be arranged. Fall, spring, summer. *Staff*

194. Conserving Natural Resources. Fundamentals of natural resource development, use, management, and protection based on principles of the natural and social sciences. Open only to undergraduates. 3 units. Spring. *Royer*

Applied Resource Science

205. Silvics and Measurement of Forest Vegetation. Introduction to silvical characteristics, identification and analysis of forest vegetation including comparative growth patterns of different species. Methods of measuring volume and growth of trees and stands and assessing forest product quality. Emphasis on field techniques and subsequent analysis and interpretation of mensurational data. 4 units. Fall. *Davis*

206.-Forest Ecosystems. Interactions of forest vegetation, animals, and the environment are viewed in a systems context. Topics include historical development of forest ecology; environmental driving forces of precipitation and radiation; within-ecosystem transfers of water, energy, and nutrients; conceptual properties of forest ecosystems; and the impacts of forest management practices. 4 units. Fall. *Binkley*

207. Biology of Forest Insects and Diseases. Fundamentals of entomology and plant pathology as applied to forest protection; coordinated laboratory work, with emphasis on identification and interpretation of forest and wood degradation. 4 units. Fall. *Stambaugh*

208. Fire Behavior and Use. Impacts of destructive agents upon forests; principles of combustion, fire behavior, danger measurement and suppression; use of fire in forest management. 3 units. Spring. *Staff*

211. Resource Ecology and Ecosystem Management. An application of ecological principles to applied resource and environmental problems with an emphasis on the ecosystem as a basic working unit. Perspectives include such topics as land/water interactions, the patchiness concept, succession, energy flow, productivity, mineral cycling, perturbation effects on ecosystems, and limiting factors. Laboratory studies will focus on the team approach to analyzing the biotic and abiotic components of the ecosystem and impact analysis. 4 units. Fall. *Richardson*

212. Ecosystem Dynamics in Silviculture. Information about forest ecosystems is integrated with silviculture to form a decision and control process for producing biologically possible combinations of benefits. Timber, wildlife habitats, streamflow, recreation opportunities, and other benefits are assessed singly and in combinations. Principles of cybernetics and system dynamics are used. 3 units. Spring. *Boyce*

213. Silviculture. Consideration of the decision-making processes by which prescriptions are formulated for regeneration, tending, and harvesting of forest stands. Biological features underlying stand manipulation are stressed and economic, harvesting, and utilization variables are discussed as appropriate. Emphasis on principles and techniques that transcend vegetational types or geographic regions. Prerequisite: 211 or equivalent. 4 units. Spring. *Davis*

214. Tree Biology. Life processes and properties of trees, including anatomical, development, physiological, and chemical considerations. Emphasis on structure in relation to function in the tree and to uses of tree-derived products. 3 units. Fall. *Barnes*

215. Forest Entomology. Identification, biology, and control of insects that cause damage to trees and wood products. Emphasis of diagnosis is based on the characteristics of the damage and the stages of the insects responsible. Prerequisite: 207 or equivalent or consent of instructor. 4 units. Spring. *Staff*

216. Forest Pathology. Diseases of North American forests and their timbers, with emphasis on current literature and control strategies. Field and laboratory diagnosis. Prerequisite: 207 or consent of instructor. 3 units; 4–5 units with laboratory. Spring. *Stambaugh*

217. Anatomy of Woody Plants. Primary and secondary structures in seedlings and in mature trees, shrubs, and vines. Techniques for gross observations and for study of micro- and ultrastructures with light and electron microscopy. Relationship of microstructures to growth patterns and characteristics. Comparative studies in relation to environmental adaptations and systematics. 4 units. Spring. *Philpott*

218. Barrier Island Ecology. Adaptation of plants to barrier island migration and other physical characteristics of the coastal environment. Major emphasis will be placed on management of barrier beaches from Maine to Texas and the impact of human interference with natural processes. Field studies. Prerequisite: course in general ecology. Offered at the Duke Marine Laboratory, Beaufort, North Carolina. 6 units. Summer, term 1. *Godfrey*

220. Soil Classification and Interpretation. Soil characteristics and environmental factors related to soil formation and soil classification systems. Interpretation of soil properties and soil maps for determination of forest, rural, and urban fringe use capabilities and limitations. Effects of forest management practices on soil productivity. Laboratory includes field identification of soils and measurements of soil properties. 4 units. Fall. *Ralston*

230. Weather and Climate. Overview of the science of meteorology and principles of climatology, especially as applied to problems in ecology and natural resource management. Emphasis on the processes and characteristics of weather phenomena and local and regional climates. General introduction to sources of climatic data and climatic data analysis. Includes laboratory. 4 units. Fall. *Knoerr*

231. Environmental Climatology. Applications of climatology to solving problems in the areas of applied ecology; land use planning; forest, water resource, and air quality management. History of the atmosphere and world climates is

considered to provide a perspective on current conditions. Impact of weather on human behavior, property, and natural resource management. 3 units. Spring. *Staff*

232. Microclimatology. Introduction to the micrometeorological processes. Discussion of the integration of these processes and the resulting microclimates in the rural (forest, field, and water surface) and urban environments. Methods for modification of the microclimate. 3 units. Spring, odd-numbered years. *Knoerr*

234. Watershed Hydrology. Introduction to the hydrologic cycle with emphasis on the influence of land use, vegetation, soil types, climate, and land forms on water quantity and quality and methods for control. Development of water balance models. Analysis of precipitation patterns, rainfall and runoff, and nonpoint source impacts. Statistical handling and preparation of hydrologic data, simulation and prediction models, introduction to groundwater flow, laboratory and field sampling methods. 4 units. Fall. *Marin*

236. Water Quality Management. Types, sources, and effects of pollutants. Water quality standards and criteria. Engineering approaches to water management. Mathematical models and their application to water quality management. Federal regulations, in particular, the Federal Water Pollution Control Act amendments of 1972 and 1977. Economic and policy analysis for water quality management planning. 3 units. Fall. *Reckhow*

238. Limnological Principles of Aquatic Resource Management. Analysis of resource problems arising from human use and interaction with water resources. Chemical, biological, and physical limnological processes are considered in relation to introduction of toxicants and nutrients into aquatic systems, removal or addition of biotic components, modification of the physical environment, and other current concerns. Prerequisite: course in aquatic ecology or consent of instructor. 4 units. Spring. *Staff*

302. Ecological Toxicology. Study of environmental contaminants from a broad perspective encompassing biochemical, ecological, and toxicological principles and methodologies. Emphasis on sources, environmental transport and transformation phenomena, accumulation in biota and ecosystems, and impacts at various levels of organization. Prerequisites: general ecology and vertebrate physiology or consent of instructor. 3 units. Fall. *Di Giulio*

303. Seminar in Ecotoxicology. Discussion of current topics concerning environmental contaminants. Individual students review a chosen topic and lead subsequent discussion. Guest speakers. 1 unit. Spring. *Richardson and Di Giulio*

309. Chemical Aspects of Forest Protection. Chemical aspects of organisms attacking trees and of the materials used in their control. Emphasis on structures and properties in relation to functions and uses. Prerequisite: 207. 3 units. Spring. *Barnes*

310. Forest Productivity and Mineral Cycling. An ecosystem approach to studying the processes affecting productivity and mineral cycling in the world's forests. Emphasis on primary production, biomass accumulation, and biogeochemical cycling as affected by edaphic and climatic conditions. Concepts of ecosystem analysis and research methodology are stressed. Prerequisites: consent of instructor; course work in plant physiology, soils, and statistics is recommended. 3 units. Spring, even-numbered years. *Richardson and Binkley*

312. Forest Biochemistry. Biochemistry applied to structure and function of woody plants and associated fungi and insects. Prerequisites: courses in plant physiology and chemistry. 3 units. Fall. *Barnes*

313. Wildland and Wildlife Management. Overview of wildlife management in relation to land use, properties of wildlife populations, elements of game

range, manipulation of food and cover, agencies involved in wildlife conservation, and the role of public and political involvement. 3 units. Spring. *Staff*

315. Ecology of Tree Diseases. Fundamentals of phytopathology as applied to field and laboratory investigations of tree diseases and wood degradation; biological interpretation of host-pathogen-environment interaction is stressed in literature review, experimentation, and scientific writing. Prerequisite: consent of the instructor. 4 units. Fall. *Stambaugh*

316. Seminar in Forest Protection. Current problems in forest and shade tree protection and research applications in entomology, pathology, and physiology as related to natural resource management. Prerequisite: consent of instructor. 1 unit. Spring. *Stambaugh*

317. Seminar in Integrated Case Studies in Natural Resource Analysis. Examination and analysis of the integrated case study for solving resource and environmental problems. Prerequisite: consent of instructor. 1 unit. Offered on demand. *Richardson*

318. Seminar in Forest Resource Management. Examination and analysis of techniques employed in the management of industrial and public forests, particularly in the South; discussion of problems of large-scale intensive forest management. Prerequisites: 213 and 274 or equivalents. 1 unit. Fall, spring. *Staff*

319. Seminar in Natural Resource Ecology. Discussion of current ecological and environmental problems and research topics related to the management of natural resources. 1 unit. Spring. *Staff*

322. Microbiology of Forest Soils. Ecology of the microbial populations of forest soils, with emphasis on rhizosphere interactions, root pathogenesis, and mycorrhizae. Prerequisite: consent of instructor; mycology and bacteriology are recommended. 4 units. Spring, odd-numbered years. *Stambaugh*

324. Wetlands Ecology. The study of bogs, fens, marshes, and swamps. Emphasis on processes within the ecosystem: biogeochemical cycling, decomposition, hydrology, and primary productivity. Ecosystem structure, the response of these systems to perturbations, and management strategies are discussed. A research project is required. Prerequisites: 211 or equivalent and consent of instructor. 3 units. Spring, odd-numbered years. *Richardson*

328. Forest Soil Fertility. Relationships of soil fertility factors to the growth of forest stands. Soil chemical properties and biological processes affecting mineral nutrition of trees. Soil amendment practices, including forest fertilization and land disposal of municipal wastes. Laboratory analysis of chemical composition of soil, water, and plant tissue samples. Prerequisite: 220. 4 units. Spring. *Ralston*

330. Environmental Monitoring and Instrumentation. Methods of measuring and monitoring the earth's physical environment with emphasis on water and air resources. Characteristics and uses of contemporary sensors, measurement and data acquisition systems. Methods of obtaining and processing computer compatible data records. Includes laboratory. 4 units. Spring. *Knoerr*

338. Micrometeorology and Biometeorology Seminar. Advanced topics in the physics of the earth's surface environment, with emphasis on plant and animal microclimates; budgets of mass, momentum, and energy; vertical structure of wind, temperature, water vapor, and carbon dioxide in relation to exchange processes within the biosphere. Prerequisites: 232 or equivalent and consent of instructor. 2 units. Offered on sufficient demand, either fall or spring. *Knoerr*

349. Integrated Case Studies in Toxicology. Students are assigned topics relative to their chosen research discipline in toxicology and are asked to develop

case studies to present at a roundtable workshop. Emphasis on review and analysis of toxicological problems from a holistic (multidisciplinary) viewpoint. 1 unit. Spring. *Richardson or Di Giulio*

Quantitative Methods

250. Computer Programming for Resource Management. Introduction to computer programming with applications in optimization, simulation, and use of probability models. Half course (first half). 2 units. Fall. *Boyd*

251. Natural Resource Data Analysis. Elements of statistical inference and estimation including exploratory data analysis, regression, analysis of variance. Introduction to matrix algebra. Half course (second half). 2 units. Fall. *Jayne and Reckhow*

256. Remote Sensing for Resource Management. An examination of remote sensing systems as sources of information in resource management with an emphasis on aerial photography and multispectral scanners. Emphasis on the interpretation of airborne and space imagery. 3 units. Fall. *Davison*

262. Applied Population Ecology. Discussion of population dynamics of natural and exploited populations. A quantitative approach with an emphasis on mathematical models and their application to population problems. 3 units. Spring, even-numbered years. *Staff*

263. Harvesting and Transportation Systems. Analysis of cable, tractor, and aerial harvesting systems. Sawlog and pulpwood transportation. Emphasis on material flow, inventory control. Application of simulation and optimization methods to harvesting, loading, and transport. Half course (first half). 2 units. Spring. *Jayne*

264. Manufacturing Systems. Study of material processing in sawmills, pulpmills, plywood plants, and composite board manufacturing facilities. Emphasis on material flow, quality control, inventory control. Application of quantitative methods and economic analysis to forest product manufacturing operations. Half course (second half). 2 units. Spring. *Jayne*

325. Forest Yield. Productivity of forest trees and stands, particularly as a function of silvicultural manipulation; analysis of stand responses such as growth rate, stem form, tree quality, product quality and value. One or more growth models are assessed for biological reality and usefulness to forest managers. Prerequisite: 213. 3 units. Fall, odd-numbered years. *Davis*

331. Water Resource Systems. Introduction to the fundamentals of water resource systems planning and management. Emphasis on optimization, simulation, statistical and economic principles for management of surface and subsurface water resources. Topics include project selection and evaluation, design of standards and regulations, stochastic and deterministic quantity/quality simulation models, water supply and waste water treatment technologies, decision and risk analysis. 3 units. Spring. *Marin*

350. Statistical Estimation and Inference for Resource Management. Regression analysis with nonexperimental data, simultaneous equations, time series analysis using Box-Jenkins methods. Emphasis on natural resource management applications and inferences for policy evaluation and planning. 4 units. Spring. *Reckhow*

353. Analysis of Resource Systems. Introductory survey of linear and nonlinear difference and differential equations important in resource management and environmental decision making. Graphical, analytic, and numerical methods

of solution, determination of equilibrium and stability, oscillatory and chaotic systems, boundary value problems. Prerequisite: consent of instructor. 3 units. Fall. *Boyd*

354. Quantitative Ecology for Resource Management. Application of quantitative methods, including statistics and computer simulation, to a resource problem. Class project in a local ecosystem. Project objectives emphasize data collection, analysis, and presentation. Prerequisites: background in ecology, statistics, FORTRAN programming, and consent of instructor. 4 units. Spring. *Maguire*

355. Optimization Methods for Resource Management. Introductory survey of optimization techniques useful in resource management and environmental decision making. Numerical techniques for unconstrained optimization, linear programming, dynamic programming and optimal control methods. Prerequisite: consent of instructor. 3 units. Spring. *Boyd*

368. Seminar in Water Quality Modeling. Study of existing water quality simulation models using sensitivity analysis and experimental design. 1 unit. Spring. *Reckhow*

Natural Resources Economics and Policy

270. Resource Economics and Policy. The application of economic concepts to private and public sector decision making concerning natural and environmental resources. Investment analysis, benefit-cost analysis. Planning and policy concepts. Prerequisite: introductory course in microeconomics or consent of instructor. Fall. *Hyde*

274. Forest Resource Management. Principles of organizing forest properties for systematic management; use of data obtained in surveys and inventories; principles of forest regulation, including a study of normal and actual forests, rotations, cutting cycles, and methods of regulating the cut in even-aged and all-aged forests for sustained yield; introduction to the preparation of preliminary forest management plans. 3 units. Spring. *Staff*

283. Environmental Policy and Values. Discussion of varying philosophical approaches to the allocation and use of natural resources and the environment. Views espoused by ecologists, preservationists, naturalists, conservationists, economists, planners, theologians, lawyers, and political scientists are considered. Through extensive readings, students consider who values what in society, and who gets what, when, and how. Prerequisite: consent of instructor. 3 units. Fall. *Royer*

372, 373. Advanced Natural Resource Economics. Survey of advanced topics in natural resource and environmental economics. Emphasis on renewable resources and public policy. Prerequisite: consent of instructor. Two courses, 3 units each. Fall and spring. *Hyde*

377. Seminar in Natural Resource Allocation and Efficiency. Evaluation of economic principles concerned with problems of natural resource allocation, with special attention to the alternatives for governmental policies in private property economics. Prerequisite: consent of instructor. 1 unit. Fall, even-numbered years. *Staff*

381. Natural Resource Policy. An examination of institutions and processes in the public sector that influence natural resource allocation and use of the environment. Emphasis on political allocation of resources, especially legislative and administrative processes. Current natural resource and environmental policy is briefly surveyed. Prerequisite: 270. 3 units. Spring. *Royer*

382. Environmental Perspectives: Risks, Rights, Regulations. Study of current societal concern pertaining to environmental risks, the process of their regulation in a representative democracy, and the socioeconomic consequences of government regulatory policies. 3 units. Fall. *Staff*

388. Seminar in Resource and Environmental Policy. Discussion of the political, legal, and socioeconomic aspects of public and private action in environmental quality control and management. Prerequisites: 270 and consent of instructor. 1 unit. Fall, spring. *Staff*

Intensive Courses

219. Urban Forest Management. Discussion of requirements for healthy growth of trees and shrubs in urban situations. Topics include genetics, physiology, natural history, soil and habitat management, and the politics and scope of urban forestry. Lectures and field trips. 1 unit, intensive. Fall. *Perry*

249. Peat for Energy. Introduction to peat as a source of energy for the United States and the world. Natural development of peat and its physical characteristics. Economic feasibility and tools for analysis. Environmental problems related to development of peat energy reserves. 1 unit, intensive. Fall. *McMullan*

252. Computer Applications in Forestry. Overview of the applications of computer technology to problems in forest management. Review of hardware and software capabilities, procedures for planning and implementation, practical applications in forestry operations. 1 unit, intensive. Spring. *Vasievich*

258. Forest Appraisal. Presentation of the principles of real estate appraisal as they apply to valuation problems in forestry. Consideration of appraisal theory, accounting and tax concepts in forest land management. Application of financial analysis techniques to forest land management through lectures and problem solving sessions. 3 units, intensive. Fall. *Sizemore*

272. Forest Research Management. Concepts of problem identification, project planning, and implementation in forestry research; group management techniques and transfer of research results. 1 unit, intensive. Fall. *Bentley*

273. Forest Utilization. Introduction to utilization in the managed forest and the principal wood-using industries. Taught as a one-week field seminar. May be taken by nonforestry majors. 1 unit, intensive. Spring. *Staff*

276. Management of Southern Hardwood Forests. Overview of the factors influencing the overall management and silviculture of hardwood forests in the southern United States. Lectures and case studies. 1 unit, intensive. Spring. *McKnight*

277. Economics of Fire Management. Guidelines for economic analysis of fire management alternatives. Emphasis on the ability to develop appropriate economic evaluations and comparisons of options. 1 unit, intensive. Spring. *Vasievich*

278. Analyzing Forest Resources for Industry. Forest Survey interpretation from an industrial point of view. Emphasis on timber availability, industrial forest land policies, financial analysis problems, and profit center possibilities for forest management. 1 unit, intensive. Spring. *Guttenberg*

280. Economics in Forest Planning and Program Implementation. The role of economics in planning in public and private forest organizations. Emphasis on analysis of goals to develop decision criteria for budget formulation and project selection. 1 unit, intensive. Fall. *Row*

284. Water Resource Management Policy. Examination of established state and federal programs in water resource planning, allocation, and management and current proposals for their reform. 1 unit, intensive. Spring. *Stickley*

285. Public Participation in Natural Resource Decisions. Discussion of the principles, objectives, and effectiveness of public participation in the planning process. Second generation environmental and natural resource legislation requiring public participation. Techniques for successful public involvement. 1 unit, intensive. Spring. *Stickley*

286. Legal Aspects of Land Use. Review of the legal aspects of land use, illustrating the impact of legislation, litigation, and court decisions on the land use planning process, with special consideration of the conflicts between development pressures and efficient, sound resource management. 2 units, intensive. Spring. *Cummings*

287. Forest Policy. Exploration of the process of public policy formulation and review of the history of forest policy over more than a century, with particular emphasis on the past decade. Discussion of the processes by which recent legislation was passed, its content, and its probable consequences. 1 unit, intensive. Spring. *Clawson*

288. Forest Taxation. Review of the principles of timber taxation as applied to forest management, including income (capital gains), estate and property taxation. Types of timber transactions discussed include outright sales, cutting contracts, and leases. Proper treatment of expenses, depletion basis, and casualty losses are considered. Emphasis on solution of practical problems using actual reported cases. 1 unit, intensive. Fall, spring. *Condrell*

289. Legislative Regulation of Private Forest Practices in the United States. Examination and analysis of forest practice and other types of environmental legislation as these affect traditional forest management activities. Discussion of the legal and constitutional basis for such statutes, their basic regulatory provisions, and problems experienced in administration. Potential and actual effects of selected state and federal laws on woodland management are evaluated. 1 unit, intensive. Fall. *Siegel*

314. Choices in Silviculture. Quantitative methods are used to evaluate silvicultural options for producing flows of timber, cash, water, wildlife habitats, and other benefits. Information for forestry is translated into quantitative terms and analyzed with system dynamics techniques. Applications for increasing the production of forests within biophysical and economic constraints. 1 unit, intensive. Fall. *Boyce*

370. Economics of Intensive Forestry. Analysis of investment in intensive forestry and comparison of alternative uses of land and capital. Methods commonly used to determine financial returns: financial maturity, present net value, internal rate of return, cash flow and benefit-cost calculations. 1 unit, intensive. Spring. *Dutrow*

374. Special Tax Problems for Industrial Timberland Owners. Current problems of industrial timber taxation including the use of subsidiaries in sales, Internal Revenue Service audits, valuation, financing of land, and casualties. Prerequisite: 288 or equivalent experience. 1 unit, intensive. Fall. *Condrell*

383. Natural Resources Conflict Management. Current issues in the natural resources field and methods of solution, including conflict avoidance, joint planning, mediation, conciliation, public participation, and consensus building. Role of the National Environmental Policy Act. 1 unit, intensive. Spring. *Busterud*

Special Studies and Projects

201. Field Studies. Visits to and studies of resource use and management areas and activities outside the University. Variable registration fee. Units to be arranged. Fall, spring, summer. *Staff*

202. Student Projects. A group of five or more students may plan and conduct their own research project on a special topic, not normally covered by courses or seminars. A request to establish such a project should be addressed to the dean with an outline of the objectives and methods of study and a plan for presentation of the results to the school. The dean will designate the units to be earned and a faculty member for the evaluation and grading of the work of each participant. Fall, spring, summer.

290. Practicums in Resource Management. Professional-level problem solving in aspects of resource management with emphasis on field and laboratory work. Variable topics. Some sections may require travel and students may be assessed a fee to cover expenses. 3 units. May. *Staff*

299. Independent Projects. Directed readings or research at the graduate level to meet the needs of individual students. Units to be arranged. Fall, spring, summer. Students should register for the course number listed below for the supervising faculty member.

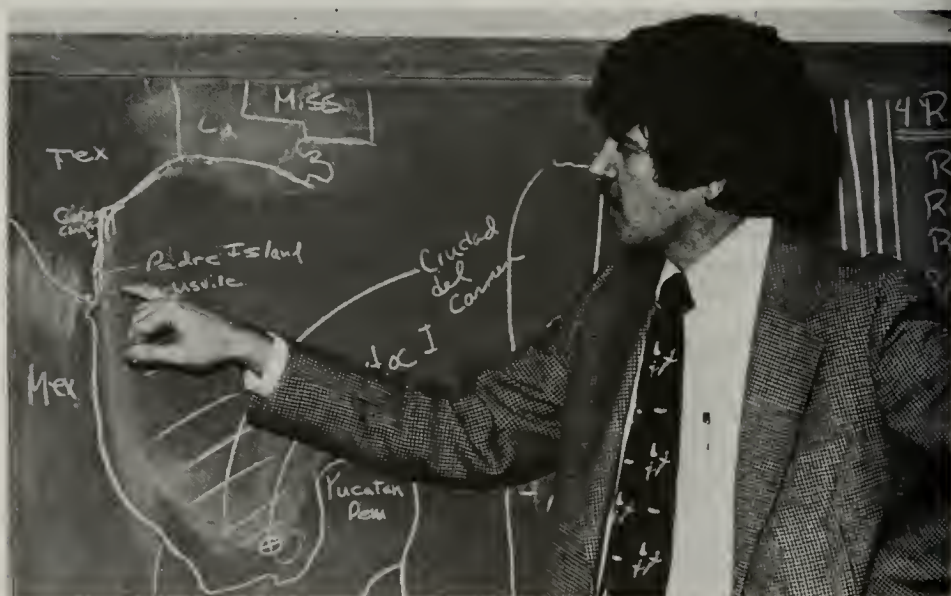
299.1 Barnes	299.16 Hyde
299.2 Binkley	299.17 Jayne
299.3 Boyce	299.18 Knoerr
299.4 Boyd	299.19 Maguire
299.5 Briede	299.20 Marin
299.6 Christensen	299.21 Philpott
299.7 Condrell	299.22 Ralston
299.8 Davis	299.23 Reckhow
299.9 Davison	299.24 Richardson
299.10 Di Giulio	299.25 Royer
299.11 Dutrow	299.26 Runge
299.12 Gelbert	299.27 Sizemore
299.13 Hart	299.28 Stambaugh
299.14 Heath	299.29 Vasievich
299.15 Hellmers	299.30 Vesilind

399. Master's Project. An applied study of a forestry or environmental management problem or a theoretical research effort. A seminar presentation of the objectives, methodology, and preliminary findings is required. A written (or other medium) report at the conclusion of the project is also required. Units to be arranged. Undertaken with the guidance of the student's adviser. Fall, spring, summer.

Numerical Listing of Courses

- 191,192. Independent Study in Forestry and Environmental Studies
- 194. Conserving Natural Resources
- 201. Field Studies
- 202. Student Projects
- 205. Silvics and Measurement of Forest Vegetation
- 206. Forest Ecosystems
- 207. Biology of Forest Insects and Diseases
- 208. Fire Behavior and Use
- 211. Resource Ecology and Ecosystem Management
- 212. Ecosystem Dynamics in Silviculture
- 213. Silviculture
- 214. Tree Biology
- 215. Forest Entomology
- 216. Forest Pathology
- 217. Anatomy of Woody Plants

218. Barrier Island Ecology
219. Urban Forest Management (intensive)
220. Soil Classifications and Interpretation
230. Weather and Climate
231. Environmental Climatology
232. Microclimatology
234. Watershed Hydrology
236. Water Quality Management
238. Limnological Principles of Aquatic Resource Management
249. Peat for Energy (intensive)
250. Computer Programming for Resource Management
251. Natural Resource Data Analysis
252. Computer Applications in Forestry (intensive)
256. Remote Sensing for Resource Management
258. Forest Appraisal (intensive)
262. Applied Population Ecology
263. Harvesting and Transportation Systems
264. Manufacturing Systems
270. Resource Economics and Policy
272. Forest Research Management (intensive)
273. Forest Utilization (intensive)
274. Forest Resource Management
276. Management of Southern Hardwoods (intensive)
277. Economics of Fire Management (intensive)
278. Analyzing Forest Resources for Industry (intensive)
280. Economics in Forest Planning and Program Implementation (intensive)
283. Environmental Policy and Values
284. Water Resources Management Policy (intensive)
285. Public Participation in Natural Resource Decisions (intensive)
286. Legal Aspects of Land Use (intensive)
287. Forest Policy (intensive)
288. Forest Taxation (intensive)
289. Legislative Regulation of Private Forest Practices in the United States (intensive)
290. Practicums in Resource Management
299. Independent Projects
302. Ecological Toxicology
303. Seminar in Ecotoxicology
309. Chemical Aspects of Forest Protection
310. Forest Productivity and Mineral Cycling
312. Forest Biochemistry



- 313. Wildland and Wildlife Management
- 314. Choices in Silviculture (intensive)
- 315. Ecology of Tree Diseases
- 316. Seminar in Forest Protection
- 317. Seminar in Integrated Case Studies in Natural Resource Analysis
- 318. Seminar in Forest Resource Management
- 319. Seminar in Natural Resource Ecology
- 322. Microbiology of Forest Soils
- 324. Wetlands Ecology
- 325. Forest Yield
- 328. Forest Soil Fertility
- 330. Environmental Monitoring and Instrumentation
- 331. Water Resource Systems
- 338. Micrometeorology and Biometeorology Seminar
- 349. Integrated Case Study in Toxicology
- 350. Statistical Estimation and Inference for Resource Management
- 353. Analysis of Resource Systems
- 354. Quantitative Ecology for Resource Management
- 355. Optimization Methods for Resource Management
- 368. Seminar in Water Quality Modeling
- 370. Economics of Intensive Forestry (intensive)
- 372, 373. Advanced Natural Resource Economics
- 374. Special Tax Problems for Industrial Timberland Owners (intensive)
- 377. Seminar in Natural Resource Allocation and Efficiency
- 381. Natural Resource Policy
- 382. Environmental Perspectives: Risks, Rights, Regulations
- 383. Natural Resources Conflict Management (intensive)
- 388. Seminar in Resource and Environmental Policy
- 399. Master's Project



Appendix

Students Registered for the Master of Forestry Degree

- Adler, John Morel (B.A., University of North Carolina; M.A., Johns Hopkins University), Bahama, North Carolina
- * Aspenon, Melissa M. (B.S., The University of the South), Lexington, Kentucky
- * Baldwin, Beth M. (A.B., Middlebury College), Lexington, Massachusetts
- * Bégin, Stephen James (B.S., University of Massachusetts), New Bedford, Massachusetts
- * Boyer, Chris Deborah (A.B., Franklin and Marshall College), Media, Pennsylvania
- * Burak, Steven G. (B.S., Rutgers University), Tallassee, Alabama
- * Creitz, Walter M. (Albright College), Reading, Pennsylvania
- * Deo, Narayan Prasad (B.S., C. M. College of Dharbangha; M.S., L. S. College of Muzaff), Sapatary, Nepal
- Dresser, Shelley J. (B.A., Queens College of the City University of New York), Briarwood, New York
- * Early, Richard James (Willamette University), Kailua, Hawaii
- * Fillingham, Jack Paul (B.S.F., University of Georgia), Tallassee, Alabama
- * Fox, Carol Sue (B.S., Miami University of Ohio), Columbus, Ohio
- * Goodall, McChesney (A.B., Duke University), Pittsboro, North Carolina
- * Grotz, Paul Allen (B.A., Gettysburg College), Huntington Station, New York
- * Haxby, Thomas Stuart (B.A., Wittenberg University), Wyoming, Ohio
- * Hensley, James Anthony (B.S., Concord College), Danville, West Virginia
- * Herbine, Frederick W. (B.S.F., Moravian College), Willow Grove, Pennsylvania
- * Joshi, Shanker Bahadur (I.Sc., Tri-Chandra College; B.S., Rangoon University), Kathmandu, Nepal
- * Jurius, Francis W. (Duke University), Chelmsford, Massachusetts
- * Kanel, Keshav Raj (G.S., Amrit Science College; B.S., Tri-Chandra College; A.I.F.C., Indian Forest College), Ruske, Nepal
- * Kiefer, Mark Andrew (B.S.F., Moravian College), Bethlehem, Pennsylvania
- * Koirala, Bimal Prasad (I.Sc., U. P. Board; B.S., M.S., Tribhuvan University), Bhojpur, Nepal
- * Leonard, James Brian (B.S.F., University of New Hampshire), Northport, New York
- * Lindemann, Barbara J. (B.A., Whitman College), Aurora, Oregon
- * Lücke, Oscar A. (B.F., Costa Rica Institute of Technology), San Jose, Costa Rica
- * Mason, George Henry (A.B., Kenyon College; M.B.A., Cornell University), Farmington, Connecticut
- * McDonald, Brian Neil (B.S., Brandeis University), Hampton, Virginia
- * Mesaros, Gail T. (B.S., Marshall University), Englishtown, New Jersey
- * Miller, Pamela Jean (B.S., Moravian College), Jamestown, Pennsylvania
- * Morris, Julia McNeill (B.A., University of Virginia), Blanch, North Carolina
- * Owen, Jeffrey Hance (B.A., Drew University), West Long Branch, New Jersey
- * Paige, Sharon Lynn (A.B., Vassar College), Charlottesville, Virginia
- * Ritacco, Jeffrey L. (B.S., Rollins College), St. Paul, Minnesota
- * Smith, Dalton James (B.S.F., Auburn University), Jackson, Alabama
- * Smith, Thomas Ferguson (B.A., Drew University), Woodbury, New Jersey
- * Tammi, Nancy Diane (B.S., The College of William and Mary), Maywood, New Jersey
- * Torgerson, Linda (B.S., Elizabethtown College), Manasquan, New Jersey
- * Waldbauer, Eric (B.S., State University of New York at Cortland), Cortland, New York
- * Wildermuth, Robin R. (A.B., Dartmouth College), Sharon, Vermont
- * Young, David L. (Lenoir-Rhyne College), Silver Spring, Maryland

Students Registered for the Master of Environmental Management Degree

- Adams, Christine Fitzgerald (B.S., Southern Connecticut State College), Durham, North Carolina
- * Andrew, Gregory Mark (B.S., Bard College), Wellesley, Massachusetts
- * Baden, Richard Timothy (B.A., Cornell College), Tulsa, Oklahoma
- * Becker, Edward Theodore (B.A., Ohio State University), Durham, North Carolina
- * Bernick, Henry Clayton, III (B.F., University of Virginia), Virginia Beach, Virginia
- * Boyle, James E. (Washington and Lee University), St. Mary's, Pennsylvania
- * Browne, Nancy Keyes (B.A., Albion College), Oak Park, Illinois
- * Butcher, Jonathan E. (A.B., Harvard University), Cary, North Carolina
- * Cannell, John Robert (B.S., Beloit College), Durand, Illinois
- * Carney, Lynda (A.B., Duke University), New Providence, New Jersey
- * Chitterling, Carin Page (B.A., The College of Wooster), Annapolis, Maryland
- * Chow, Alice Hsi-Ming (B.S., Cornell University), Stamford, Connecticut
- * Clark, Charlotte Reeves (A.B., Duke University), Durham, North Carolina
- * Clements, John Trevor (B.A., Augustana College), Mount Prospect, Illinois
- * Cooper, Richard Steven (B.S., Duke University), Pittsfield, Massachusetts
- * Cornell, Kenneth Bryan (B.A., Gettysburg College), Livingston, New Jersey

* Attended an undergraduate institution participating in the Cooperative College Program.

- Creager, Clayton Stewart (B.A., The Evergreen State University), Durham, North Carolina
- *Cross, Cecil Calvin, III (B.A., Gettysburg College), Flourtown, Pennsylvania
- *Daniels, Steven Eric (B.A., Whitman College), Hamilton, Montana
- Davis, Elizabeth Bowman (B.A., University of New Hampshire), Hillsborough, North Carolina
- Davis, Thomas Palmer (B.S., Virginia Polytechnic Institute and State University), Jacksonville, Florida
- Dodd, Randall Clark (B.S., University of North Carolina at Chapel Hill), Chapel Hill, North Carolina
- *Dodson, David Lewis (B.A., The College of William and Mary), Culpepper, Virginia
- *Eddy, Lisa Kay (B.S., The College of William and Mary), Roanoke, Virginia
- Einbender, Gail (B.A., Cornell University), Scarsdale, New York
- Ehrlich, Corinne (B.A., Goucher College), Towson, Maryland
- *Ericsson, George (B.S., Muhlenberg College), Bartlett, Tennessee
- Fasanella, Robert A. (B.S.B.A., University of New Haven; A.B., Duke University), Orange, Connecticut
- *Gauthey, Julie E. (B.S., The College of William and Mary), Springfield, Virginia
- Gillespie, Dorothy (A.S., Middlesex Community College; B.A., Wesleyan University), Middletown, Connecticut
- Gilruth, Peter Thomas (B.A., Blackburn College), LaGrange, Illinois
- Griscom, Elizabeth Starr (A.B., Radcliffe College), Lexington, Massachusetts
- Hines, Deborah Anne (B.A., University of Montana), Bozeman, Montana
- *Homsher, Cynthia Ann (B.A., Gettysburg College), Reading, Pennsylvania
- Hughes, Mark Douglas (B.S., University of Massachusetts), Cambridge, Massachusetts
- *Hunt, Frances Anne (B.S., The College of William and Mary), Lorton, Virginia
- *King, Richard Francis (B.S., Franklin and Marshall College), Orono, Maine
- Klemmer, Richard A. (B.S., University of New Hampshire), Lexington, Massachusetts
- Kniecik, Barbara J. (A.B., Vassar College), Augusta, Georgia
- *Lang, Rebecca (A.B., Duke University), Baltimore, Maryland
- *Luderer, Lynn Marie (B.A., Drew University; M.A., Ohio State University), Buffalo, New York
- *MacConnell, Gary Scott (B.A., Gettysburg College), Southboro, Massachusetts
- Martin, Katherine Mary (B.S., Union College), Amawalk, New York
- *Maul, Michael David (B.S., Allegheny College), Williamsville, New York
- McAndrew, Joan G. (B.A., Douglass College), Arlington, Virginia
- *McIntire, Pamela Ellen (B.S., The College of William and Mary), Columbia, Maryland
- *McIntyre, Wendy Margret (B.A., The Colorado College), Nampa, Idaho
- *McManaway, Christine Joy (B.A., Albion College), Monroe, Michigan
- *Meese, Gregory J. (Duke University), Cincinnati, Ohio
- *Mercurio, Kimberley S. (B.A., Ohio Wesleyan University), Bay Village, Ohio
- *Miller, Edgar Morris (A.B., Duke University), Lexington, North Carolina
- *Mohin, Timothy James (B.S., State University of New York at Cortland), McDonough, New York
- Nardone, Ronald F. (B.A., St. Lawrence University), Concord, Massachusetts
- *Nixon, Heather Loucks (B.S., The College of William and Mary), Arlington, Virginia
- *Perlic, Thomas Edward (B.S., Allegheny College), Verona, Pennsylvania
- Plonski, Daniel R. (A.S., College of Staten Island; B.A., State University of New York at Plattsburgh), Staten Island, New York
- Puffer, Cynthia Ann (B.A., New College of the University of South Florida), West Seneca, New York
- *Quin, Gordon Dubose (B.S., Duke University), Durham, North Carolina
- *Ramig, Jeanne E. (B.S., Indiana University of Pennsylvania), Butler, Pennsylvania
- *Reid, Holly F. (Duke University), Rumson, New Jersey
- *Riesenkönig, Ute Henrika (B.S., Duke University), Saarbrücken, West Germany
- *Robb, Valerie Scot (B.S., Indiana University of Pennsylvania), Lancaster, Pennsylvania
- *Roden, Eric Eugene (Lebanon Valley College), Harrisburg, Pennsylvania
- Rogge, Lee Ann (B.A., Dartmouth College), Alexandria, Virginia
- Ryan, Elizabeth Ann (B.A., Amherst College), Auburndale, Massachusetts
- *Salcines, Craig Alan (B.S., Muhlenberg College), Sparta, New Jersey
- *Shaw, Richard Edward (A.B., Duke University), Yardley, Pennsylvania
- Silverstein, Mark Elliot (B.A., State University of New York at Oswego), Valley Falls, New York
- *Simon, Charles Michael (B.A., Grinnell College), Clayton, Missouri
- Smith, Mark Griffin (A.B., Harvard University), San Anselmo, California
- Sontheimer, Sally Ann (B.A., Syracuse University), Tulsa, Oklahoma
- *Steg, Ronald Felix, II (A.S., Jamestown Community College; B.S., State University of New York at Cortland), Jamestown, New York
- *Tassel, Sandra Jo (B.A., The Colorado College), Colorado Springs, Colorado
- Tramm, Edwin Capper (B.S., University of Illinois), Chapel Hill, North Carolina
- Tribble, Thomas Nelson (B.A., Vanderbilt University), Richmond, Virginia
- Vignola, Nanette (B.A., Queens College of the City University of New York), Malverne, New York
- Weant, Charles G. (A.A.S., Gaston Technical Institute; B.S., Winston-Salem State University), Bahama, North Carolina

Wear, David Norman (B.A., University of Montana), Missoula, Montana
 *Welfare, John Spaugh (A.B., Duke University), Charlotte, North Carolina
 *Wheeler, Jane Wallace (A.B., Duke University), Pittsburgh, Pennsylvania
 *Witty, Diane L. (B.S., Allegheny College), Easton, Pennsylvania
 Woods, Joseph Godfrey (B.S., University of North Carolina at Chapel Hill), Winston-Salem, North Carolina
 Yavelak, Gregory (B.S., Pennsylvania State University), Yonkers, New York
 Zaret, Joshua Lee (B.A., Hampshire College), Glen Head, New York

Students in the Department of Forestry and Environmental Studies of the Graduate School

In Residence

Andrianarivo, Jonah A. (E.E.S.A., E.E.S.S., University of Madagascar), Antanarino, Madagascar
 Anderson, Elizabeth Carr (B.A., University of Wisconsin; M.P.S., Cornell University), Callao, Virginia
 Bechtold, William Anthony (B.S., Purdue University), Asheville, North Carolina
 Bies, Janine Marie (B.S., Clarke College), Chicago, Illinois
 Carey, William Allen (A.S., Miami-Dade Junior College; B.S., M.S., University of Florida), Naranja, Florida
 Edson, Michael M. (B.A., Pomona College), Chicago, Illinois
 Goodell, Sally Ann (B.S., University of Idaho), Boise, Idaho
 Hart, Stephen Coert (B.S., University of California at Berkeley), Canoga Park, California
 Heath, Jennifer Sue (B.S., University of Massachusetts; B.S., North Carolina State University), Whitesboro, New York
 Heimerman, Jeffrey Scott (B.S., Lawrence University), Neenah, Wisconsin
 Ho, Mengchi (B.S., National Taiwan University), Taipei, Taiwan
 Hufford, Stephen Sims (A.B., Dartmouth College), McLean, Virginia
 Jacobson, Paul T. (B.A., Cornell University), Hamilton, Virginia
 Klyza, Christopher James (B.S., Cornell University), Williamsville, Illinois
 Krutilla, Kerry Maca (B.A., Grinnell College), Washington, D.C.
 Mack, Karen L. (A.B., Duke University), Durham, North Carolina
 Maida, James Mullen (B.A., Hamilton College), East Syracuse, New York
 Marks, Barbara Jean (B.A., Goucher College), Joppa, Maryland
 Marschner, Bernd (University of Hohenheim, Free University of Berlin), Berlin, West Germany
 Mitchell, James E. (B.S., University of California at Irvine; M.S., University of Michigan), Orange, California
 Nash, Bruce Lyle (B.A., University of Connecticut; M.S., Duke University), Berkeley Heights, New Jersey
 Newman, David Hilder (B.S., University of California at Berkeley), Santa Rosa, California
 O'Hara, Kevin Laughlin (B.S., Humboldt State University), Olympia, Washington
 Park, Yun Sil (B.S., Ewha Woman's University), Seoul, Korea
 Schoch, Peter Bradford (B.A., Middlebury College), Nashua, New Hampshire
 Strickholm, Peter W. (B.A., The Colorado College), Bloomington, Indiana
 Valentine, David William (B.A., Wittenberg University), Springfield, Ohio
 Walker, Jane Cathrine (B.S., Cornell University), Corning, New York
 Wick, John Glen (B.A., University of Notre Dame; M.L.A., University of Virginia), Baton Rouge, Louisiana

In Absentia

Carr, David (B.A., University of Florida; M.P.A., Florida Atlantic University), Tallahassee, Florida
 Keenan, Russell Edward (B.S., Bates College), Branford, Connecticut
 Liggett, Annette Sue (B.S., Kent State University), Stow, Ohio
 Meadors, Merewyn Davis (B.S., B.A., Morris Harvey College; M.S., Marshall University), St. Albans, West Virginia
 Meardon, Kenneth Robert (B.S., Cook College of Rutgers University), New Brunswick, New Jersey
 Topa, Mary Ann (B.A., Case Western Reserve University), Morgantown, West Virginia

On Leave of Absence

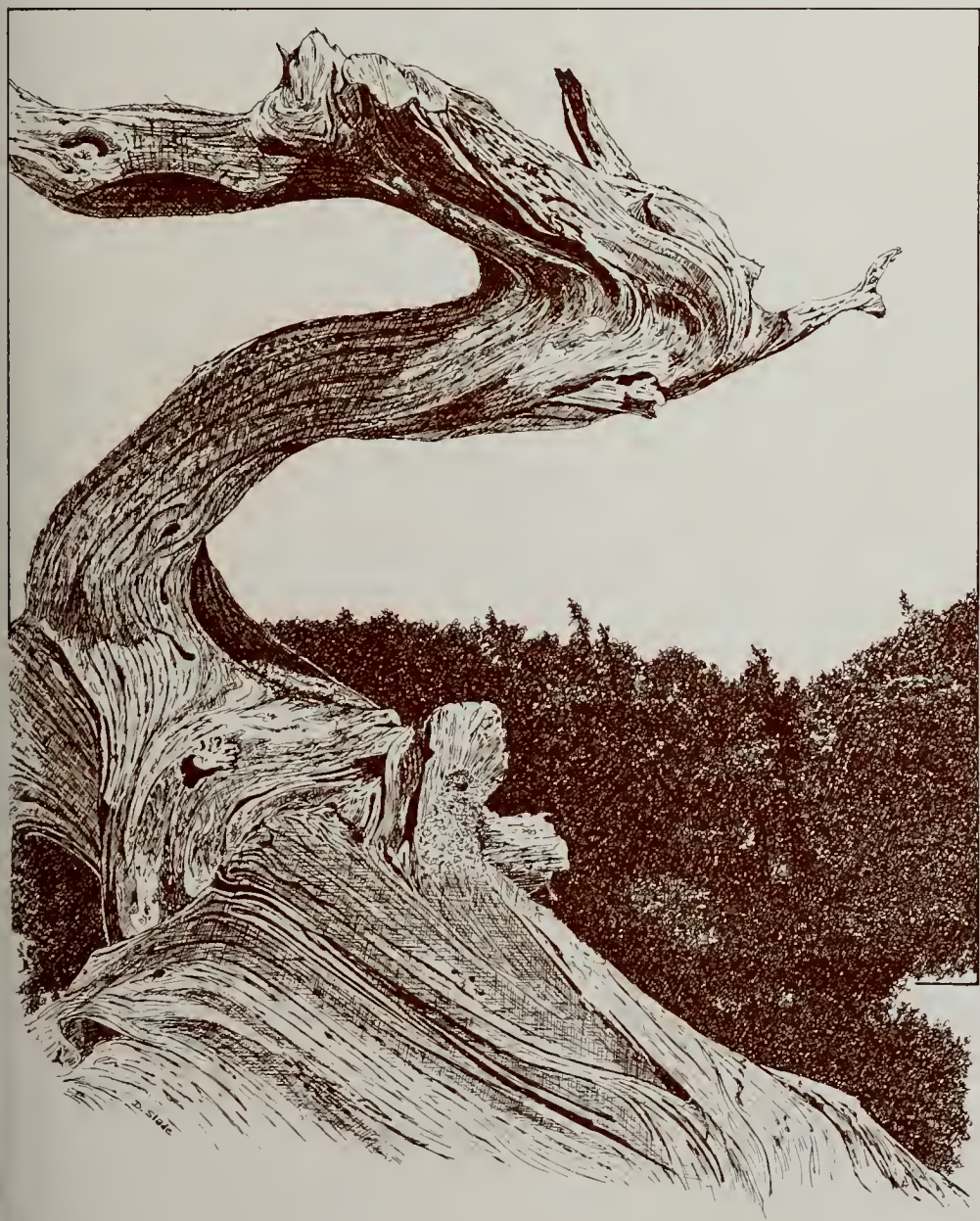
Brueggman, Roberta Lee (B.S., Indiana University of Pennsylvania), Pittsburgh, Pennsylvania
 Judge, Rebecca Priscilla (A.B., Smith College; M.S., University of Minnesota), Durham, North Carolina
 Lesh, Steven August (B.S.Ch.E., University of Cincinnati; M.S.E.E., M.A.C.T., University of North Carolina at Chapel Hill), Chapel Hill, North Carolina
 Simpson, John Warfield (B.S.L.A., Ohio State University; M.L.A., Harvard University), Columbus, Ohio
 Stubbs, Jack (B.S., Michigan State University; M.F., University of Minnesota), Charleston, South Carolina

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Marine Laboratory





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EDITOR
Judy A. Beck
SENIOR EDITORIAL ASSISTANT
Elizabeth Matheson
PHOTOGRAPHS
Scott D. Taylor
COVER DESIGN
Donna S. Slade

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University Administration

Terry Sanford, J.D., LL.D., D.H., L.H.D., D.P.A., *President*
H. Keith H. Brodie, M.D., *Chancellor*
William Bevan, Ph.D., LL.D., Sc.D., *Provost*
Charles B. Huestis, *Vice-President for Business and Finance*
William G. Anlyan, M.D., D.Sc., *Vice-President for Health Affairs*
Eugene J. McDonald, LL.M., *Vice-President for Government Relations and University Counsel*
William J. Griffith, A.B., *Vice-President for Student Affairs*
Stephen Cannada Harward, A.B., C.P.A., *Treasurer and Assistant Secretary*
J. Peyton Fuller, A.B., *Assistant Vice-President and Corporate Controller*
Roger L. Marshall, A.B., *Secretary of the University*
Andrew G. Wallace, M.D., *Associate Vice-President for Health Affairs*
Mel Ray, M.B.A., *Vice-Chancellor for Data Processing*
Joel L. Fleishman, LL.M., *Vice-Chancellor*
Craufurd Goodwin, Ph.D., *Dean of the Graduate School*
Ernestine Friedl, Ph.D., *Dean of Arts and Sciences and Dean of Trinity College*
Calvin L. Ward, Ph.D., *Director of the Summer Session*

Administration of the Marine Laboratory

*John D. Costlow, *Director*
†Joseph S. Ramus, *Assistant Director for Academic Programs*
Richard T. Barber, *Assistant Director for Oceanographic Programs*
Joseph Bonaventura and Celia Bonaventura, *Assistant Directors for Marine Biomedical Programs*
Michael P. Bradley, *Assistant Director for Administration and Development*

Advisory Committee

Louis Quin, *Professor of Chemistry, Chairman of the Committee*
Jack B. Chaddock, *Professor of Mechanical Engineering and Chairman, Department of Mechanical Engineering and Materials Science*
John D. Costlow, *Professor of Zoology and Director, Duke University Marine Laboratory*
Ernestine Friedl, *James B. Duke Professor of Anthropology and Dean of Arts and Sciences and Dean of Trinity College*
Orrin H. Pilkey, *Professor of Geology*
Boyd Strain, *Professor of Botany*
Stephen A. Wainwright, *Professor of Zoology and Chairman, Department of Zoology*
Robert E. Webster, *Professor of Biochemistry*
Ex-Officio
Colin Blaydon, *Professor of Public Policy Studies and Business Administration and Vice-Provost for Academic Policy and Planning*
David R. Shumate, *Director of Sponsored Programs*
Calvin L. Ward, *Professor of Zoology and Director of the Summer Session*

Academic Staff

Richard T. Barber, *Professor of Botany and Zoology and Director of the Duke/University of North Carolina Oceanographic Consortium. Biological oceanography.*
†Robert D. Barnes, *Professor of Biology, Gettysburg College, (visiting summer faculty). Marine invertebrate zoology.*
Celia Bonaventura, *Assistant Medical Research Professor—Biochemistry. Protein structure and function.*
Joseph Bonaventura, *Assistant Medical Research Professor—Biochemistry. Protein structure and function.*
C. G. Bookout, *Professor Emeritus in Zoology. Marine invertebrate embryology and invertebrate zoology.*
‡Thomas G. Connelly, *Associate Professor of Anatomy, University of Michigan, (visiting summer faculty). Developmental biology.*
§John D. Costlow, *Professor of Zoology. Marine invertebrate embryology and experimental zoology.*
Richard B. Forward, *Associate Professor of Zoology and Director of Undergraduate Student Affairs, Marine Laboratory. Physiology of marine animals.*

*On sabbatical leave February through August 1983.

†Acting Director, February through August 1983.

‡Summer only.

§On sabbatical February through August 1983.

- John Gutknecht, *Professor of Physiology*. Membrane physiology.
 William W. Kirby-Smith, *Associate Research Professor—Marine Laboratory*. Marine ecology.
 Svata M. Louda, *Assistant Research Professor—Marine Laboratory*. Population ecology.
 ‡David R. McClay, *Associate Professor of Zoology and Assistant Professor of Immunology*. Developmental biology.
 ‡Kenneth R. McKaye, *Associate Research Professor—Marine Laboratory*. Behavioral ecology.
 ‡Thomas B. Mowbray, *Associate Professor of Biology, Salem College, (visiting summer faculty)*. Plant ecology.
 ‡Orrin H. Pilkey, *Professor of Geology*. Geological oceanography.
 ‡Joseph S. Ramus, *Associate Professor of Botany and Director of Graduate Student Affairs, Marine Laboratory*. Algal ecological physiology.
 ‡Craig W. Schneider, *Associate Professor of Biology, Trinity College, (visiting summer faculty)*. Benthic marine algae.
 ‡Richard B. Searles, *Associate Professor of Botany*. Marine phycology.
 ‡Ralph A. Sorensen, *Assistant Professor of Biology, Gettysburg College, (visiting summer faculty)*. Developmental biology.
 ‡J. Bolling Sullivan, *Associate Professor of Biochemistry*. Comparative and evolutionary biochemistry.
 ‡John P. Sutherland, *Associate Professor of Zoology*. Marine ecology.
 ‡Ralph Winter, *Professor of Economics, Acadia University, (visiting summer faculty)*. Economics of fisheries.

Support Staff

Cynthia K. Baldwin, *Manager, Personnel and Auxiliaries*
 Olive C. Godette, *Housekeeping Supervisor/Reservationist*
 Claudia O. Davis, *Housekeeper*
 Catherine Gibbs, *Housekeeper*
 Eunice T. Godette, *Housekeeper*
 Mildred E. Tyre, *Housekeeper*
 Bettie E. Tyson, *Housekeeper*
 L. Thomas Morton, *Head Cook*
 Sylvester Murray, *Assistant Head Cook*
 Gracie A. Jordan, *Housekeeper*

Norris A. Hill, *Manager, Physical Plant*
 Clifton W. Davis, *Maintenance Foreman*
 Ellen D. Jones, *Accounting Clerk Senior*
 James G. Chadwick, *Groundskeeper*
 Donald Gagnon, *Electrician*
 Horace R. Holland, *Mechanic*
 Vance G. Mason, *Carpenter Senior*
 James L. Willis, *Captain, R/V First Mate*

Dianne R. Gagnon, *Manager, Finances*
 Sylvia S. Dowd, *Staff Specialist*
 Linda K. Johnson, *Staff Specialist*
 Sophia D. Turnage, *Materials Support Specialist*

Mamre M. Wilson, *Staff Assistant*
 Helen E. Nearing, *Word Processor*
 Linda Trembeczki, *Receptionist/Switchboard Operator*
 Vera J. Vann, *Receptionist/Switchboard Operator*

Michael P. Bradley, *Assistant Director for Administration and Development*
 Margaret J. Forward, *Artist Illustrator*
 Scott D. Taylor, *Photographer*

Joseph S. Ramus, *Assistant Director for Academic Programs*
 William D. Hunnings, *Electronics Technician Senior*
 Lilian I. Lorenzsonn-Willis, *Staff Specialist*
 Jean S. Williams, *Library Assistant Senior*

Joseph Bonaventura and Celia Bonaventura, *Codirectors of the Marine Biomedical Center*
 Belinda K. Beckwith, *Administrative Secretary*

Joseph F. Ustach, *Executive Officer, Duke/University of North Carolina Oceanographic Consortium*
 Norma Jean Buck, *Administrative Secretary*
 Eric B. Nelson, *Marine Superintendent, Duke/University of North Carolina Oceanographic Consortium*

Dorothy T. Johnson, *Administrative Secretary*
George A. Newton, *Equipment Officer, Duke/University of North Carolina Oceanographic Consortium*

Timothy W. Boynton, *Electronics Technician Senior*
David L. Bunting, *Draftsman Senior*
Richard C. Ogus, *Master, R/V Cape Hatteras*
Orville G. Weeks, *Chief Engineer, R/V Cape Hatteras*
Curtis A. Oden, *Deck Engineer, R/V Cape Hatteras*
Benjamin H. Smith, *Steward/Cook, R/V Cape Hatteras*
Dale H. Murphy, *Second Mate, R/V Cape Hatteras*
Richard S. Leddy, *First Assistant Engineer, R/V Cape Hatteras*
William Shepherd, *Cook/Messman, R/V Cape Hatteras*
Bradlee Woodward, *Boatswain, R/V Cape Hatteras*
Larry N. Morris, *Ordinary Seaman, R/V Cape Hatteras*





General Information



The Beaufort Setting

The Duke University Marine Laboratory is situated on fifteen acres of the southern portion of Pivers Island, within the Outer Banks system of North Carolina, and adjacent to the historic town of Beaufort. Beaufort itself is the third oldest town in the state and is surrounded by fishing and agricultural communities. Cape Lookout National Seashore Park and Carrot Island/Bird Shoal, a proposed Rachel Carson Preserve, are located within easy boating distance of the Marine Laboratory. From the Marine Laboratory, as well as from the Beaufort waterfront and its boardwalk, one can often see feral Banks horses grazing leisurely, see egrets or pelicans flying by, or just observe the beautiful natural scenery.

The Natural Resources for Study and Research

The area's system of barrier islands, sounds and estuaries is well-known for its rich flora and fauna, and diverse habitats, including rivers, creeks, mud flats, unspoiled sand beaches, dunes, marshes, peat bogs, cypress swamps, bird islands, and coastal forests, making the area an excellent haven for both nature lovers and/or those interested in the pursuit of marine science. The area lies within the range of both the northern and southern species of biota. The edge of the Gulf Stream system is about thirty-five miles offshore, with occasional reefs in between. A great variety of phytoplankton, seaweeds, seagrasses, and marsh-grasses may be found in the area. Common animals include the blue crab, squid, shrimps, snails, clams, ctenophores, jellyfish, hydroids, sponges, polychaetes, sea urchins, starfish, brittle stars, sand dollars, skimmers, terns, gulls, herons, sea turtles, porpoises, and many different types of fish. All provide ample opportunity for study and research and are readily accessible from the Marine Laboratory on foot, by car, or by boat.

The Marine Laboratory

This rich abundance of marine flora and fauna attracted Dr. A. S. Pearse and his friends to Pivers Island, which was subsequently selected as a location for a marine laboratory. Through the efforts of Dr. Pearse, the land was acquired for the Duke University Marine Laboratory, and in 1938 the first summer classes were offered. Originally, the laboratory served only as a summer training and research facility.

The Marine Laboratory has experienced tremendous growth since 1938, and today operates year-round to provide training and research opportunities to more than 1,500 persons annually, including undergraduate and graduate students enrolled in the laboratory's academic programs, visiting student groups who utilize the laboratory's facilities, as well as scientists who come from North America and abroad to conduct their own research.

The Marine Laboratory is an interdepartmental training and research facility of Duke University, and as such operates under the policies, procedures, and regulations of the University. Each resident faculty member is affiliated with one or more department of the University. The resident faculty represent the fields of biochemistry, ecology, developmental biology, oceanography, physiology, and systematics.

Pivers Island is only 150 yards across the channel from Beaufort, with a bridge leading to U.S. Highway 70, making the island readily accessible by automobile. Other transportation to the laboratory consists of bus service to Beaufort and airline service to regional airports (New Bern, Kinston, or Jacksonville).

The modern physical plant consists of twenty-three buildings, including five dormitories, a large dining hall, one residence, boathouse, storehouse for ship's gear, classroom laboratories, six research buildings, and a maintenance complex.

On the Marine Laboratory campus there are recreational facilities for fishing, swimming, rowing, sailing, shuffleboard, volleyball, and croquet. There are also ample opportunities for recreation in and around Beaufort. The Beaufort area is well-known for its moderate climate, tempered by the Gulf Stream.

The laboratory's year-round seminar/lecture series features many distinguished scientific speakers from across the nation and abroad who help to acquaint both students and fellow researchers with the latest findings in their respective research areas, or present other lectures of a more general nature. Many of the lectures are open to the public as well as to personnel from surrounding marine facilities.

The Beaufort-Morehead City area provides location for five other marine-oriented facilities which serve to produce one of the higher concentrations of marine scientists in a single given locality. These are the University of North Carolina, Institute of Marine Sciences; North Carolina State University, Seafood Laboratory; State of North Carolina, Marine Resources Center; State of North Carolina, Division of Marine Fisheries; and the National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Beaufort Laboratory. This concentration of marine scientists provides a critical mass for the pursuit of science and education.

THE DUKE/UNIVERSITY OF NORTH CAROLINA OCEANOGRAPHIC CONSORTIUM

The Oceanographic Consortium operates a 131-foot research vessel, the R/V *Cape Hatteras*, a coastal zone research vessel. In 1983 the ship will operate in the western North Atlantic, concentrating in the region between Nova Scotia and the Caribbean. In that region there are about fourteen cruises; most of the cruises will involve biological and physical studies and one or two will carry out geological work. The ship is a member of the academic research fleet supported by the National Science Foundation for the purpose of providing shiptime to investigators who have NSF research grants. Investigators supported by other agencies may use R/V *Cape Hatteras* on the condition that the agency pay ship costs. R/V *Cape Hatteras* is also used for training at sea by Cape Fear Technical Institute and by the five universities that make up the Oceanographic Consortium (Duke, North Carolina State, UNC-Chapel Hill, UNC-Wilmington, and East Carolina).

THE MARINE BIOMEDICAL CENTER

The National Institute of Environmental Health Services (NIEHS), provides support to the Duke University Marine Biomedical Center with the objective of promoting research in the marine sciences relevant to problems of environmental health. The research goals of the Duke University Marine Biomedical Center are to gain an understanding of the mechanisms involved in the adaptation of man and other organisms to an environment that is both hostile and continually changing. Emphasis is on the biochemical and biological impact of metallic pollutants.

Studies at the center concern: (1) the effects of chemical pollutants on respiratory proteins and electron transport proteins; (2) the effects of metal and nonmetal pollutants on larval development of various invertebrates; (3) pollutant toxicology using blood as a model organ; (4) behavioral aspects of pollution of estuarine and marine systems; (5) the role of metal and nonmetal pollutants in processes associated with animal, plant, and artificial membrane systems; and (6) effects of heavy metals on ion transport phenomena and cellular membrane potentials. Feasibility studies are conducted to explore the advantages of various experimental approaches and to encourage innovative research.

The Beaufort Experience

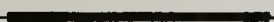

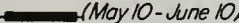

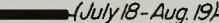

The Marine Laboratory is a mini-community and the self-sufficient nature of its residential life appears to well suit those who come here to study or to conduct research. The academic programs are limited to fifty students per term (spring, summer, or fall), making for small group learning. Although recreational opportunities are ample, the distractions are limited, allowing both student and researcher to become totally involved in the pursuit of marine science. Both students and researchers alike find that the Marine Laboratory has an invitingly open, friendly, and relaxed atmosphere which appears to draw many back year after year. This friendliness or community feeling, as well as the potential for total immersion has become part of what has been termed the Beaufort experience.



Academic Programs



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1983 Duke University Marine Laboratory Academic Calendar												
Program	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Spring	 (Jan. 10 - April 29)											
COOP*	 (April 18 - May 21)											
Summer	 (May 10 - June 10)											
	 (June 13 - July 15)											
	 (July 18 - Aug. 19)											
Fall	 (Sept. 1 - Dec. 21)**											
<div>* Cooperative Undergraduate Program In Marine Science</div> <div>** Tentative dates</div>												

Spring Term—Undergraduate Marine Sciences Program

10 January–29 April 1983

The curriculum consists of the courses listed below. Students have a choice between two courses of study. First, a student would enroll in IDC 104, in either Zoology 150L or Botany 115L, in two seminars, and in independent study. The second option is similar, except the student does not perform an independent study project and enrolls in both Zoology 150L and Botany 115L. We encourage students to choose the first course of study.

Public Policy and the Marine Environment. (Interdisciplinary Course 104.) Economic, legal, medical, political, social, and scientific viewpoints on the effect of human society on the marine environment; special emphasis on coastal North Carolina. Lectures and projects. One course. *Ramus and staff*

Phytoplankton. (Botany 115L.) Taxonomy, physiology, and community ecology of these life forms and their role in the biology of the seas. Laboratory and

field exercises emphasize techniques of the biological oceanographer. Prerequisite: introductory biology. One course. *Ramus*

Physiology of Marine Animals. (Zoology 150L.) Environmental factors, biological rhythms, and behavioral adaptations in the comparative physiology of marine animals. Prerequisites: introductory biology and chemistry. One course. *Forward*

Natural History of Coastal Marine Systems. (Botany 296S.50 or Zoology 296S.50.) Readings, discussion, oral reports, and field trips emphasizing the ecological adaptations of marine plants and animals to several representative shallow marine habitats. Half course. *Costlow/Kirby-Smith*

Adaptations of Organisms to the Marine Environment. (Biochemistry 220S.01.) Introduction to basic concepts of biochemistry and to variables in the marine environment which evoke adaptive responses. Specific adaptations at the molecular level. Biological fitness from a biochemical viewpoint. Half course. *Bonaventura*

One other seminar having a value of one-half course will also be offered (TBA). *Staff*

Independent Study. (Biochemistry 210, Botany 192, or Zoology 192.) For seniors and juniors with consent of the appropriate Director of Undergraduate Studies and the supervising instructor. One course. *Staff*

COOPERATIVE UNDERGRADUATE PROGRAM IN THE MARINE SCIENCES

18 April–21 May 1983

During the late spring, the Duke University Marine Laboratory offers an intensive five-week program on the marine environment to students from institutions which have no marine laboratory facilities.

Lectures in the program cover the physical, chemical, geological, and biological aspects of the marine environment with emphasis on the ecology of marine organisms. Numerous field trips are made to estuarine and near-shore habitats which involve environmental measurements, identification of plants and animals collected, and discussion with emphasis on morphological, physiological, and ecological adaptations to the particular habitat. Live animals are used in laboratory experiments on physiology and behavior aimed at an understanding of the functioning of animals and their natural environment. Students read original research papers, give oral reports on relevant topics, and submit written reports on laboratory and field work.

First Summer Term

10 May–10 June 1983

The Economics of Fisheries. (Economics 60.) Economic analysis of the fisheries as a common property resource. Emphasis will be on mixed ocean fisheries including descriptions of world fisheries resources, trends in production and in consumption. The importance of technological change, market structures, management jurisdictions and income distributions will also be considered. Seminars with Sea Grant and Fisheries Councils personnel as well as visits to processing plants will be arranged where possible. One course (3 s.h.*). *Winter (visiting summer faculty)*

*Semester hour(s) = s.h.



Plant Ecology. (Botany 147L/247L.) Principles of the relationships between plants and their environments. Emphasis on structures and processes of coastal plain ecosystems. Not open to students who have had Botany 146L/246L. Prerequisite: introductory biology. One and one-half courses or 6 graduate units (6 s.h.). *Mowbray (visiting summer faculty)*

Introduction to Biological Oceanography. (Zoology 114L.) Physical, chemical, and biological processes of the oceans, emphasizing special adaptations for life in the sea and factors controlling distribution and abundance of organisms. Laboratory emphasis. Not open to students who have had Geology 53 or Botany 53. Prerequisite: introductory biology. One and one-half courses (6 s.h.). *Staff*

Physiology of Marine Animals. (Zoology 150L/250L.) Environmental factors, biological rhythms, and behavioral adaptations in the comparative physiology of marine animals. Prerequisites: introductory biology and chemistry. One course or 4 graduate units (4 s.h.). *Forward*

Marine Invertebrate Zoology. (Zoology 176L.) Structure, functions, and development of invertebrates collected from estuarine and marine habitats. Not open to students who have had Zoology 173, 174, 175, 274, or 275. Prerequisite: introductory biology. One and one-half courses (6 s.h.). *Bookhout (Professor Emeritus)*

Independent Study. (Botany 191 or Zoology 191.) For senior and junior majors with permission of the appropriate Director of Undergraduate Studies and the supervising instructor. Course credit to be arranged. *Staff*

Research. (Botany 359.) Individual investigation in the various fields of botany. Credit to be arranged. (For graduate students only.) *Staff*

Research. (Zoology 353.) To be carried on under the direction of the appropriate staff members. Hours and credit to be arranged. (For graduate students only.) *Staff*

Second Summer Term

13 June–15 July 1983

Barrier Island Ecology. (Botany 218 or Environmental Studies 218.) Adaptation of plants to barrier island migration and other physical characteristics of the coastal environment. Major emphasis will be placed on management of barrier beaches from Maine to Texas and the impact of human interference with natural processes. Field studies. Prerequisite: course in general ecology. One and one-half courses or 6 graduate units (6 s.h.). *Staff*

Benthic Marine Algae. (Botany 219.) Morphology, reproduction, life histories, systematics, and natural history of seaweeds. Lectures, laboratories, and field work in ocean and estuaries. Prerequisite: introductory biology; plant diversity recommended. One course or 4 graduate units (4 s.h.). MWF. *Schneider (visiting summer faculty)*

Comparative and Evolutionary Biochemistry. (Biochemistry 276.) Lectures and discussion of the origin of life, evolution of the genetic code, mutation and protein polymorphism, natural selection and protein structure, and comparison of homologous proteins and nucleic acids. Laboratory work involves the purification and characterization of homologous proteins from fish and invertebrates; salt fractionation, electrophoresis, ion-exchange and molecular exclusion chromatography, fingerprinting, molecular weight determination, amino acid composition, and other related approaches. Prerequisite: consent of the instructor. One and one-half courses or 6 graduate units (6 s.h.). *Sullivan*

Marine Ecology. (Zoology 203L.) Application of ecological theory to marine systems. Mathematical properties of population growth and species interactions;

field and laboratory projects with computer-assisted analysis of data. Practice in scientific writing. Readings from current scientific publications. Prerequisites: introductory biology or invertebrate zoology, and calculus. Knowledge of statistics helpful. One and one-half courses or 6 graduate units (6 s.h.). *Staff*

Independent Study. (Botany 192 or Zoology 192.) For senior and junior majors with permission of the appropriate Director of Undergraduate Studies and the supervising instructor. Course credit to be arranged. *Staff*

Research. (Botany 360.) Individual investigation in the various fields of botany. Credit to be arranged. (For graduate students only.) *Staff*

Research. (Zoology 354.) To be carried on under the direction of the appropriate staff members. Hours and credit to be arranged. (For graduate students only.) *Staff*

Third Summer Term

18 July–19 August 1983

Marine Biology. (Tentative.) A general course designed to fulfill the natural science requirement for the liberal arts major. The course will provide a basic knowledge of the physical and chemical characteristics of marine ecosystems and the functional adaptations of marine organisms to these systems. Daily lectures will be followed with field trips to surrounding wetlands, estuaries, and coastal systems, and with laboratories on the common marine plants and animals. Lecture topics will also include aquaculture, fisheries, and the management of marine resources. Open to all students. One course (4 s.h.). *Kirby-Smith*

Primary Productivity in the Seas. (Botany 215L or Zoology 215L.) The biological flux of carbon in the coastal and open seas involving phytoplankton, seaweeds, seagrasses, and marshgrasses. The contributions of these primary producers to food chain processes and global atmospheric-sedimentary cycles, as well as the ecological consequences of variations in photosynthetic mechanisms. Prerequisites: introductory biology and introductory chemistry. One course or 4 graduate units (4 s.h.). *Barber and Ramus*

Marine Invertebrate Zoology. (Zoology 274L.) Structures, functions, and habits of invertebrate animals under natural and experimental conditions. Field trips included. Not open to undergraduate students who have had Zoology 175 or 176 except with consent of the Director of Undergraduate Studies. Prerequisite: introductory biology. One and one-half courses or 6 graduate units (6 s.h.). *Barnes (visiting summer faculty)*

Invertebrate Developmental Biology. (Zoology 278L.) Gametogenesis, fertilization, and development of invertebrates, with emphasis on experimental studies of prelarval stages. Prerequisite: consent of instructor. One and one-half courses or 6 graduate units (6 s.h.). *McClay and visiting staff*

Independent Study. (Botany 191 or Zoology 191.) For senior and junior majors with permission of the appropriate Director of Undergraduate Studies and the supervising instructor. Course credit to be arranged. *Staff*

Research. (Botany 359.) Individual investigation in the various fields of botany. Credit to be arranged. (For graduate students only.) *Staff*

Research. (Zoology 353.) To be carried on under the direction of the appropriate staff members. Hours and credit to be arranged. (For graduate students only.) *Staff*



SPECIAL FIELD STUDY IN THE CARIBBEAN

Tropical Seaweeds. (Botany 263L.) Collection, preservation, description, identification, illustration, and descriptive ecology. Two-week field study. Time and place to be announced. Details available at a later date upon request. Prerequisites: Botany 211 or 219 or equivalents. Half course or 2 graduate units (2 s.h.). *Searles*

Fall Term—Undergraduate Marine Sciences Program

2 September–21 December 1983*

The curriculum consists of the courses listed below. Students have a choice between two courses of study. First, a student would enroll in Zoology/Botany 167, in either Zoology 169L or Biochemistry 245L, in two seminars and in independent study. The second option is similar, except the student does not perform an independent study project and enrolls in both Zoology 169L and Biochemistry 245L. We encourage students to choose the first course of study.

Analysis of Marine Ecosystems. (Zoology 167 or Botany 167.) Major marine ecosystems, the physical and biological characteristics of each as a functional entity. Lectures and discussion. Prerequisites: introductory biology and chemistry. One course. *Barber*

Ecological Oceanography. (Zoology 169L.) Dynamics of marine communities in the context of current ecological theory. Life history strategies, competition, predation, diversity, and stability, followed by detailed considerations of both benthic and pelagic communities. Students may not receive credit for both Zoology 103L and 169L. Prerequisites: introductory biology and mathematics. One course. *Staff*

Macromolecules, Ecology and Evolution. (Biochemistry 245L.) Lectures on the structure and function of protein and nucleic acid molecules with particular emphasis on the application of molecular techniques in ecological, systematic, and evolutionary theory. One course. *Sullivan*

Marine Animal Navigation. (Zoology 295S.54.) Orientation to visual, chemical, mechanical, and magnetic cues. To examine aspects of the cues used for navigation, behavior involved, functional significance, and experimental design. Half course. *Forward*

Light in the Sea. (Botany 195S.04.) Properties of light in the sea and the biological consequences; orientation, bioluminescence, biological rhythms, primary production, and sensing devices. Half course. *Ramus*

Membrane Physiology. (Physiology 219S.) Principles of membrane transport, electrophysiology, and osmoregulation. Lecture and discussion includes: membrane composition and structure; water nonelectrolyte and ion transport, model membranes and reconstitution; mechanisms of cell volume and turgor pressure regulation; water and electrolyte transport through epithelia; hormonal and metabolic regulation of membrane transport; ionic and osmotic regulation in aquatic plants and animals. Half course. *Gutknecht*

Independent Study. (Biochemistry 209, Botany 191, or Zoology 191.) For seniors and juniors with consent of the appropriate Director of Undergraduate Studies and the supervising instructor. One course. *Staff*

*Tentative dates.

Graduate Program

Graduate students from any and all academic disciplines are encouraged to take professional training at the Marine Laboratory. The program operates year-round, providing course work in the marine sciences, an active seminar program, and facilities supporting dissertation research. Presently, resident graduate students number twenty and represent the Departments of Biochemistry, Botany, Forestry and Environmental Studies, Physiology, and Zoology. Ordinarily, dissertation advisers are resident as well, although this need not be the case. The Marine Laboratory has available five full-time teaching assistantships for graduate student support. In addition, tuition credits obtained from fellowship support may be applied to courses given both at the Marine Laboratory and the Durham campus, regular and summer terms. Students are admitted to degree programs in regular academic departments, not the Marine Laboratory. Generally, degree requirements, excepting dissertation research, are met on the Durham campus, then students take residence at the Marine Laboratory for dissertation research.

Visiting Scholar Programs

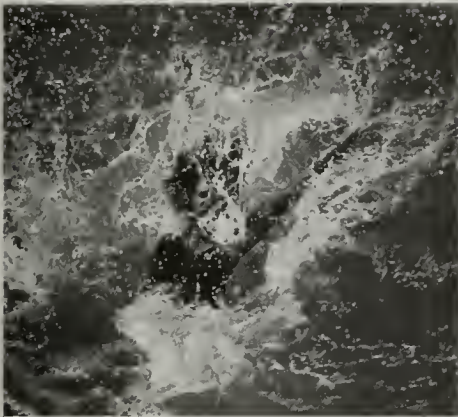
The exchange of knowledge is kept lively by several programs which bring distinguished scientists/educators to the Marine Laboratory. The Visiting Scholar Program brings lecturers for a period of several days on a monthly basis year-round. The Cocos Foundation brings visitors for longer periods of time, usually five weeks and only during the summers. The scholars, while in residence, lecture to the community at large as well as enrich specific research groups.

Requirements and Procedures

Spring and Fall Term—Undergraduate Marine Sciences Programs. During the spring and fall terms interdisciplinary programs in marine sciences provide an opportunity for undergraduate students to live and study at the Marine Laboratory. The programs are open to qualified junior and senior students. The minimal prerequisites are introductory courses in biology and chemistry. In the case of Duke students, participation in both the spring and fall terms is possible only with the permission of the Director of Undergraduate Studies in their major department.

Duke students can obtain the appropriate application form from the Director of Undergraduate Studies in their major department or by writing to the Marine Laboratory. Duke students should submit the completed application and a current academic transcript. Non-Duke students should submit the appropriate application form (contained toward the back of this bulletin), one letter of recommendation from academic faculty, and a current transcript of academic work. All completed applications and supporting credentials (from all applicants) should be received no later than the preceding November 12 (for spring term 1983) and the preceding March 25 (for fall term 1983) by the Admissions Office of the Marine Laboratory. Students will be notified of the action of the Admissions Committee shortly thereafter.

Summer Terms. Introductory level courses (numbered below 100) offered during the summer at the laboratory are open to all qualified college students; advanced level courses (numbered 100 to 199) are intended for undergraduate students from the sophomore to the senior level; senior-graduate level courses (numbered from 200 to 299) are intended for advanced undergraduates and graduate students (juniors and well-qualified sophomores may enroll in these courses with special permission). Undergraduates may not enroll in 300-level courses.



The application (found at the back of this bulletin) and current transcripts should be submitted by all applicants to Admissions, Duke University Marine Laboratory as early as possible to allow for adequate processing time and to assure a space in the desired course(s). Late applicants will be considered if space permits. All applicants will be notified by mail as promptly as possible after a decision has been reached concerning their application. After acceptance, payment of required deposit(s) is essential to reserve space in a course as well as room/board accommodations.

Students wishing to apply summer credits toward an advanced degree at Duke University must, in addition to filling in the application blank, register with the Duke University Graduate School. Students who have had adequate preparation and approval of their major professor may request space for independent or thesis research.

Summer Credit. The summer session term credit does not mean degree credit at Duke University unless the student has been admitted as a degree candidate by one of the colleges or schools of the University. Other students will be categorized as nondegree students for the summer only. A student taking a course for credit is expected to do all the work required and to take the final examination, and will receive a grade.

Summer Minimum Enrollment. Some courses are offered subject to minimum enrollments. In withdrawing a course not having adequate enrollment, every effort will be made to place the student in an alternate course which has been listed by the student as a second choice.

Summer Maximum Program Load. The maximum load for one term of the summer session at the Marine Laboratory is a one and one-half course (or 6 graduate unit) program (semester hour equivalents are listed under the course descriptions). A greater load may be possible only with the approval of the student's Dean or the appropriate Director of Graduate Studies. Non-Duke students must obtain approval from the Director.

Financial Information

Figures quoted in this section are projections and may be subject to change in many cases without prior notice. All rates, excluding tuition, student health and student activity fees, are effective 10 May 1982 to 9 May 1983.

SPRING AND FALL TERM—UNDERGRADUATE MARINE SCIENCES PROGRAMS

Tuition. Tuition for the spring term will be \$3,105. Information regarding tuition for the fall term will be available at a later date. (See also section on payment of tuition and fees.)

Health Fee. Students are required to pay \$85 for the spring term or must complete a waiver form. Information regarding the health fee for the fall term will be available at a later date.

Student Activity Fee. Information regarding the student activity fee for the spring and fall terms will be available at a later date.

Room and Board. The total room and board fee for the spring term will be \$1,575. Information regarding the room and board fee for the fall term will be available at a later date.

All dormitory occupants must supply their own linens, blankets, and towels, but pillows will be furnished. A key deposit of \$10 (per term) will be charged each person occupying a room. This deposit will be refunded at time of departure and return of key.

Full board provides for three meals a day, Monday through Saturday, and breakfast and dinner on Sunday. No credit will be allowed for meals that are missed.

Estimated Term Costs. Estimated costs for the spring term will be: tuition—\$3,105; health fee—\$85; student activity fee—to be announced; room and board—\$1,575. Estimated costs for the fall term will be available at a later date. Books, if required by the instructor, will be available at registration.

Payment of Tuition and Fees. A statement of tuition and fees will be mailed to the student. Prompt payment is expected.

SUMMER TERMS

Tuition. The following are tuition charges for summer registration.

1. Undergraduate students: \$540 for each nonlaboratory or 3 semester hour (s.h.) course; \$720 for each undergraduate laboratory or 4 s.h. course; \$360 for each half-course (2 s.h.); and \$1,080 for each one and one-half course (6 unit) program (6 s.h.) offered at the Duke University Marine Laboratory.
2. Graduate students: \$180 per unit (s.h.). For an undergraduate course, the tuition rate indicated in section 1 above is applicable.

Auditing Fees.

1. With permission of the instructor and the Director, students registered for a full program (6 s.h.) may audit courses. No extra charge is made.
2. Students carrying less than a full program (6 s.h.) may be granted permission by the instructor and the Director to audit a course, but must pay half the University fee for the course.

Health Fee. Students are required to pay an estimated \$21.50 per term or complete a waiver form.

Room and Board. Total charges for room and board are estimated at \$525 per term or higher. More definitive information will be available at a later date.

Air-conditioned dormitory rooms are available. Although every effort is made to have only two people per dormitory room, a few triple rooms may be needed to accommodate all individuals requiring dormitory space. (Upon acceptance into a course, students will be sent an acceptance and reservation form. Reservation for housing should be made on this form which should be promptly returned to the Marine Laboratory along with the room and board reservation deposit, if the student elects to utilize room and board.)

Occupants must supply their own linens, blankets, and towels, but pillows will be furnished.

Full board provides for three meals a day, Monday through Saturday, and breakfast and dinner on Sunday. There will be no credit allowed for missed meals.

Deposits.

1. **Course Deposit.** Upon acceptance into a course, a nonrefundable deposit of \$20 (per course) is required to ensure a reservation in that course. If the student properly registers for the course and attends, the deposit will be credited to tuition.
2. **Room and Board Deposit.** A \$20 deposit (per term) is required to ensure a reservation for room and board. If the student properly registers, the deposit will be credited to the room and board charge. The deposit is refundable if a student who has previously made a room and board reservation properly withdraws from a course prior to the beginning of the term. *The deposit is nonrefundable if a student who has previously made a room and board*

reservation at the Marine Laboratory subsequently decides not to utilize the room and board facilities (although he or she still plans to attend the course) and does not notify the Marine Laboratory at least two weeks prior to the beginning of the term.

3. **Key Deposit.** A key deposit of \$10 per term will be charged each person occupying a dormitory room. This deposit will be refunded at time of departure and return of the key.

Estimated Term Costs. Estimated costs for each of the summer terms will be: tuition—(see tuition section); student health fee—\$21.50; room and board—about \$525, or higher. Books, if required by the instructor, will be available at registration.

Payment of Tuition and Fees. All tuition and fees should be paid promptly either by mailing a check (payable to Duke University Marine Laboratory) prior to the beginning of the term to Accounting Office, Duke University Marine Laboratory, Beaufort, North Carolina 28516, or in person at time of registration (no later than noon of the first day of classes of the term). *Failure to pay tuition and fees by the end of the drop/add period (the first three days of classes in any term) will result in administrative withdrawal of the student.* Withdrawn students may not attend class or subsequently be registered for the term. Students who are unable to meet these deadlines should consult with the Accounting Office prior to the deadline.

LATE REGISTRATION

Late registration fees will be charged in accordance with Duke University policy unless registration is completed and all fees paid by noon of the first day of classes of any term.

REFUNDS

Spring and Fall. In the case of withdrawal from the University (and when proper notification of such withdrawal is also received by the Admissions Office of the Duke University Marine Laboratory), the student may elect to have tuition, as well as room and board (if applicable) refunded according to the following schedule:

<i>Withdrawal</i>	<i>Refund</i>
Before classes begin (Spring: two weeks prior to the beginning of the term for room and board; Fall: two weeks prior to the beginning of the term for room and board)	Full amount
During first or second week	80 percent
During third, fourth, or fifth week	60 percent
During sixth week	20 percent
After sixth week	None

In the event of death or involuntary withdrawal to enter the armed services, refunds will be made on a pro rata basis.

Summer Terms—Withdrawal Charge and Refund of Tuition and Fees. *Students who will not be attending a summer term or course for which they have been officially accepted must drop the course(s) prior to the beginning of class, even if they have not paid tuition and fees. Failure to drop the course(s) will result in administrative withdrawal at the end of the first three days of the term and billing of the student for twenty percent of the tuition plus the health fee. If tuition and fees have been paid, the following refund policies apply:*

1. When applications for withdrawal or drops from a course or term are received by the Admissions Office of the Duke University Marine Laboratory before the first class day of a given term, full tuition and fees will be refunded, except for the \$20 nonrefundable course deposit.

2. When applications for withdrawal or drops from a course or term are received by the Admissions Office of the Duke University Marine Laboratory during the first three class days of a given term, 80 percent of the tuition and the room and board fee will be refunded. The health fee will not be refunded. There will be no charge for drops and adds which result in no change in tuition.
3. When applications for withdrawal or drops from a course or term are received by the Admissions Office of the Duke University Marine Laboratory after the third class day, there will be no refund of tuition and fees.

CHECK CASHING

The banks in the Morehead City-Beaufort area have indicated that they will not cash personal checks for students unless they are guaranteed. Therefore, it is recommended that students who come to the laboratory bring with them sufficient travelers' checks, money orders, certified checks (which the banks will cash), or cash to cover expenses.

Financial Assistance

Duke University Marine Laboratory Summer Tuition Scholarships. Up to twenty summer tuition scholarships will be available to qualified students. Awards are conditional on acceptance into summer courses offered at the Duke University Marine Laboratory. In addition to the summer application and academic transcript(s) which have already been submitted by the student, the following credentials will be required to complete the scholarship application: (1) a statement of purpose for taking the particular course and, (2) one letter of recommendation from academic faculty. Intent to apply for a scholarship should be made known in writing (no separate application blank is utilized for scholarship purposes) and received by the Admissions Office of the Marine Laboratory, along with all supporting credentials, no later than April 15, 1983. Announcements of scholarship award will be made by mail shortly thereafter.

Deborah Susan Steer Memorial Scholarship in Marine-Life Sciences. Each year the income from the fund will be used to provide financial assistance to promising Duke undergraduates who wish to study marine life-sciences at the Duke University Marine Laboratory. Priority will be given to students in the summer session. Application must be made and supporting credentials received by the Admissions Office of the Marine Laboratory no later than April 15, 1983. Additional information is available from the Admissions Office of the Marine Laboratory upon request.

Teaching Assistantships. Five graduate student teaching assistantships will be available during the period of September 1983 through May 1984. Students registered in a graduate program in any department in the sciences at Duke University may apply. Recipients must be in residence at Beaufort during the period of their appointment and also conduct, or plan to conduct, their research at the Duke University Marine Laboratory in Beaufort.

Applications must be received by the Assistant Director for Academic Programs on, or before, February 28, 1983. Applicants will be judged on the basis of need, qualifications for the courses in which they will assist, and previous teaching and graduate experience. A student may receive a maximum of three years' support under the program.

For further information, write the Assistant Director for Academic Programs, Duke University Marine Laboratory, Beaufort, North Carolina 28516.

Resources for Study and Research



Research Staff and Their Programs

Dr. Richard T. Barber. Biological Oceanography.

The effects of the physical processes on the productivity and trophic structure of ocean ecosystems are studied. Work on this problem is concentrated in the Equatorial Pacific between South America and the international date line and a long-term study involving shore stations in Peru, Ecuador, and the Galapagos Islands.

Barber, R. T., and Smith, R. L. 1981. Coastal upwelling ecosystems. In *Analysis of Marine Ecosystems*, ed. A. Longhurst, pp. 31–68. Academic Press.

Barber, R. T., and Smith, W. O., Jr. 1981. The role of circulation, sinking, and vertical migration in physical sorting of phytoplankton in the upwelling center at 15°S. In *Coastal Upwelling—Coastal and Estuarine Sciences 1*, ed. F. A. Richards. Washington, D.C.: American Geophysical Union.

Drs. Joseph Bonaventura and Celia Bonaventura. Biochemical Adaptations of Organisms to the Marine Environment.

Marine organisms are found in environments characterized by great diversity in temperature, pH, salinity, oxygen availability, etc. Through biochemical studies the structural and functional diversity of these organisms and their environments is being shown to be paralleled by diversity at the molecular level. The respiratory proteins of marine organisms are being studied in order to increase the understanding of molecular adaptations and the mechanisms which give rise to functional flexibility. Investigations include measurements of the kinetics and equilibria of ligand binding to hemoglobins, hemocyanins, and cytochrome *c* oxidase with emphasis on the reactivity of these proteins as regulated by metabolic effectors. The subunit interactions involved in assembly of giant hemocyanin molecules are also under investigation. These studies are complemented by work in the Protein Engineering and Technology Laboratory where properties of chemically modified, crosslinked, and immobilized forms of biologically active molecules are characterized.

Bonaventura, C., and Bonaventura, J. 1980. Anionic control of function in vertebrate hemoglobins. *Am. Zool.* 20:131–138.

Bonaventura, J., and Bonaventura, C. 1980. Hemocyanins: relationships in their structure, function and assembly. *Am. Zool.* 20:7–17.

Wilson, M. T.; Lalla-Maharajh, W.; Darley-Usmar, V.; Bonaventura, J.; Bonaventura, C.; and Brunori, M. 1980. Structural and functional properties of cytochrome *c* oxidases isolated from sharks. *J. Biol. Chem.* 255(7):2722–2728.

Bickar, D.; Bonaventura, J.; and Bonaventura, C. 1982. Cytochrome *c* oxidase binding by hydrogen peroxide. *Biochemistry* (In press.)

Dr. C. G. Bookhout. Larval Ecology and Larval Development of Invertebrates.

This laboratory investigates the effects of pollutants, such as insecticides and drilling fluids, on the complete development of mud-crabs and blue crabs. Also, a study of the development of the family of crabs to which the blue crab belongs is being conducted.

Bookhout, C. G., and Costlow, J. D. 1977. Larval development of *Callinectes similis* reared in the laboratory. *Bull. Mar. Sci.* 27:704-728.

Bookhout, C. G.; Costlow, J. D.; and Monroe, R. 1980. Kepone* effects on larval development of mud-crab and blue crab. *Water Air Soil Pollut.* 13:57-77.

Dr. Marius Brouwer. Biochemistry of Respiratory and Metal-binding Proteins.

(1.) Basic studies on the mechanism of oxygen binding by large respiratory proteins. (2.) Determination of whether hemocyanins, hemoglobins, or red blood cells act as carriers or targets in trace metal toxicity in marine invertebrates and fish. (3.) Characterization of structure and function of trace metal-binding proteins in marine fish and shellfish.

Brouwer, M.; Bonaventura, C.; and Bonaventura, J. 1982. Heavy metal ion interactions with *Callinectes sapidus* hemocyanin: structural and functional changes induced by a variety of heavy metal ions. *Biochemistry* 21:2529-2538.

Engel, D., and Brouwer, M. 1982. Detoxification of accumulated trace metals by the American oyster, *Crassostrea virginica*: laboratory vs. environment. In *Physiological Mechanisms of Marine Pollutant Toxicity*, eds. W. B. Vernberg, A. Calabrese, F. P. Thurberg, and F. J. Vernberg. Academic Press (In press.)

Dr. Robert Cashon. Effect of Metabolic Intermediates on Hemoglobin Function.

Being investigated are the effects of metabolites on the oxygen binding properties of normal and abnormal human hemoglobins and on fish hemoglobins.

Cashon, R. 1981. The Malate Dehydrogenase Isozymes and Allozymes of *Fundulus heteroclitus*. The Johns Hopkins University Ph.D. dissertation.

Dr. John D. Costlow. Crustacean Development.

Much of the research in developmental biology deals with the culture of invertebrate larvae under controlled conditions in the laboratory, from hatching until the juvenile stages are reached. The availability of numerous larvae of known species, age, and stage of development has led to studies on the extent to which environmental factors within the marine environment affect rates of development, survival, and morphological abnormalities. In addition to studying the effects of natural environmental factors, research is under way to determine the effects of pollutants on larval development of marine crustacea. The developmental biology program also includes studies on the physiology of crustacean larvae and the factors involved in regulation of molting, rate of development, and metamorphosis during larval development.

McKenney, C. L., Jr., and Costlow, J. D., Jr. 1981. The effects of salinity and mercury on developing megalopae and early crab stages of the blue crab, *Callinectes sapidus* Rathbun. In *Biological Monitoring of Marine Pollutants*, eds. A. Calabrese, F. P. Thurberg, F. J. Vernberg and W. B. Vernberg. New York: Academic Press.

McKenney, C. L., Jr., and Costlow, J. D., Jr. 1982. The effects of mercury on developing larvae of *Rhithropanopeus harrisi* (Gould). I. Interactions of temperature, salinity and mercury on larval development. *Estuarine Coastal Shelf Sci.* 14:193-213.

Costlow, J. D., and Tipper, R. C., eds. 1982. *Interdisciplinary Research in Marine Biodeterioration*. Annapolis: Naval Institute Press.

Dr. David Evans. Marine Biochemistry.

The environmental chemistry of heavy metals in estuarine and coastal environments is being investigated, especially chemical factors which influence the biological availability of metals to marine organisms.

Evans, D. W.; Cutshall, N. H.; Cross, F. A.; and Wolfe, D. A. 1977. Manganese cycling in the Newport River estuary, North Carolina. *Estuarine Coastal Mar. Sci.* 5:71-80.

Evans, D. W.; Wiener, J. G.; and Horton, J. H. 1980. Trace element inputs from a coal burning powerplant to adjacent terrestrial and aquatic environments. *J. Air Pollut. Control Assoc.* 30(5):567-573.

Dr. Richard B. Forward, Jr. Physiological Ecology.

This laboratory investigates the behavior and physiology of estuarine and coastal zooplankton. This includes the photobehavior, photophysiology, biological rhythms, diurnal vertical migration, and horizontal migration of crustacean larvae. Past students have worked with crustaceans and chaetognaths on the effects of temperature, salinity, and feeding on phototaxis and geotaxis, salinity perception, polarized light perception, and field studies of horizontal and vertical distributions as related to environmental factors.

Forward, R. B., Jr. 1976. A shadow response in a larval crustacean. *Biol. Bull.* 151:126-140.

Forward, R. B., Jr., and Cronin, T. W. 1979. Spectral sensitivity of larvae from intertidal crustaceans. *J. Comp. Physiol.* 133:311-315.



Dr. Kenzo Fushitani. Biochemistry of Invertebrate Giant Hemoglobin.

Efforts here involve the characterization of giant hemoglobins from marine polychaetes. Also under investigation are intact hemoglobin and the separation and characterization of polypeptides and subunits. *Amphitrite ornata* hemoglobin collected locally is also being compared to the hemoglobin of *Travisia japonica* from Japan.

Dr. John Gutknecht. Membrane Physiology and Osmoregulation.

This laboratory studies the mechanisms and functions of solute and water transport through biological membranes and synthetic phospholipid bilayer membranes. Some of the specific questions sought include the following: (1.) How do heavy metals, e.g., Hg and Cd, permeate biological membranes? (2.) What is the mechanism of action of thiocyanate and other drugs on the gastric mucosa? (3.) How do water and small nonelectrolytes traverse biological membranes? (4.) What is the proton and hydroxyl ion permeability of lipid bilayer membranes? (5.) What are the rate limiting steps in weak acid/base transport through membranes?

Gutknecht, J. 1981. Inorganic mercury transport through lipid bilayer membranes. *J. Membr. Biol.* 61:61-66.

Gutknecht, J., and Walter, A. 1982. SCN⁻ and HSCN transport through lipid bilayer membranes: a model for SCN⁻ inhibition of gastric acid secretion. *Biochim. Biophys. Acta* 685:233-240.

Dr. Irving Hooper. Protein Immobilization and Biologically Active Marine Products.

Efforts here are focused on novel methods of incorporating proteins into a solid matrix to obtain both high protein concentration and full retention of biological activity. Also investigated is the use of these immobilized proteins in carrying out biochemical conversions with high efficiency and rapid conversion rates. Attention is directed to the isolation and characterization of naturally occurring barnacle repellents.

Dr. William W. Kirby-Smith. Marine Ecology.

Research includes (1.) a study of the "live bottom" or rock outcrop fauna and flora of the North Carolina Continental Shelf; (2.) a synthesis of research done in



the Newport River Estuary and a characterization of this estuarine system; and (3.) growth of suspension feeders in relation to the quantity and quality of food available.

Kirby-Smith, W. W., and Barber, R. T. 1974. Suspension feeding aquaculture systems: effects of phytoplankton concentration and temperature on growth of the bay scallop. *Aquaculture* 3:135-145.

Burle, E., and Kirby-Smith, W. 1979. Growth of the bay scallop, *Argopecten irradians* fed an artificial diet rich in protein. *Estuaries* 2:206-208.

Dr. Svata M. Louda. Population Dynamics of Herbivore/Plant Interactions.

The aim of the research is to understand the implications, dynamics, and mechanisms of population interactions, particularly for resource populations such as plants in the plant/herbivore interaction. Consequently, Dr. Louda has worked on chiton/algal population dynamics and insect predator/perennial plant dynamics as well as on several higher order interactions, such as a spider/pollinator/seed predator/plant system. The primary focus at present is on the role of insect herbivory in the abundance and habitat distribution of native mustard species and on the role of their characteristic secondary compounds (glucosinolates or mustard oil precursors) in the patterns of insect use and plant occurrence. A secondary focus is on the population dynamics underlying the aquatic plant/snail/fish interaction in Lake Malawi, Africa.

Louda, S. M. 1982. Distribution ecology: variation in plant recruitment over a gradient in relation to insect seed predation. *Ecol. Monogr.* 52(1):25-41.

Louda, S. M., and McKaye, K. R. 1982. Diurnal movements in populations of the prosobranch *Lanistes nyassanus* at Cape Maclear, Lake Malawi, Africa. *Malacologia* 23(1):13-21.

Dr. David M. Manyak. Calcification in Molluscs.

The shipworm *Bankia gouldi* normally bores through wood in the marine environment, depositing a calcified lining on the walls of its burrow. Shipworms removed from wood and stripped of their calcified burrow linings will deposit an entirely new calcified tube around their posterior end. By monitoring morphological, physiological, and biochemical changes in the animal and forming calcified tube, evidence for the mechanisms resulting in deposition of calcified structures by molluscs in general can be obtained.

Manyak, D. M.; Dillaman, R. M.; and Wilbur, K. M. 1980. Structure of the burrow lining and calcified tube of the shipworm *Bankia gouldi* (Mollusca, Teredinidae). In *Scanning Electron Microscopy/1980/III*, pp. 549-554. Chicago: SEM, Inc., AMF O'Hare.

Wilbur, K. M., and Manyak, D. M. 1982. Biochemical aspects of molluscan shell formation. In *Proceedings of the Symposium on Marine Biodeterioration*, eds. J. D. Costlow and R. C. Tipper. Bethesda: Naval Institute Press (In press.)

Dr. Kenneth R. McKaye. Behavior and Community Ecology of Fishes.

The research centers upon the evolution, behavior, and community ecology of fishes. Emphasis is upon the manner in which behavior modifies competitive and mutualistic interactions in fish communities and involves studies of altruism, optimal foraging, predator-prey interactions, and territoriality. The system that Dr. McKaye is studying in greatest detail is the cichlid fish community of Lake Malawi, Africa. This Rift Valley Lake is the most species rich lake in the world and contains more species of fish than the entire western North Atlantic. The ultimate goal of this research is to explain both the community organization of this highly complex community of closely related species and the manner by which such explosive speciation may be occurring.

McKaye, K. R. 1981. Natural selection and the evolution of interspecific brood care in fishes. In *Natural Selection of Social Behavior*, eds. R. Alexander and D. Tinkle, pp. 173–183. Chiron.

McKaye, K. R.; Kocher, T.; Reinthal, P.; and Kornfield, I. 1982. A sympatric sibling species complex of *Petrotilapia* Trewavas from Lake Malawi analyzed by enzyme electrophoresis. *Zool. J. Linn. Soc.* (In press.)

Dr. Joseph S. Ramus. Algal Ecological Physiology.

The focus of study is the physical forcing of primary productivity in a coastal plains estuary characterized by high flushing rates and variable nutrient inputs. To do so requires time-intensive sampling on the estuary—including selected water chemistry, meteorological and productivity parameters. Ultimately, the research seeks a match between species specific physiological response and the temporal frequency of nutrient availability, the phasing of the organism with its environment.

Ramus, J. 1981. The capture and transduction of light energy. In *The Biology of Seaweeds*, eds. C. S. Lobban and M. J. Wynne, pp. 458–492, Botanical Monographs, vol. 17. Oxford: Blackwell Scientific Publications.

Ramus, J. 1982. Engelmann's theory: the compelling logic. In *Synthetic and Degradative Processes in Marine Macrophytes*, ed. L. Srivastava, pp. 29–46. Berlin: Walter de Gruyter & Co.

Dr. Brenda Sanders. Hormesis: A General Stress Indicator.

The objective is to assess and predict the effects of sublethal environmental perturbation on marine invertebrates. Specifically investigated are the mechanisms of and limits to physiological adaptation in particularly vulnerable organisms, crustacean larvae. This is done by using alterations in the homeostatically controlled process of growth as an indicator of the organism's capacity to adapt to perturbation. A particular interest is delineating the biochemical mechanisms underlying growth regulation and investigating the effects of combined perturbation on an organism's adaptive capacity.

Sanders, B. M., and Costlow, J. D. 1981. Regulation of growth in larvae of the crab *Rhithropanopeus harrisi*: the effects of cyclic temperatures. *J. Therm. Biol.* 6:357–363.

Dr. Richard B. Searles. Seaweed Systematics.

Biology of seaweeds with emphasis on systematics, ecology, and biogeography of tropical algae from North Carolina and the Caribbean.

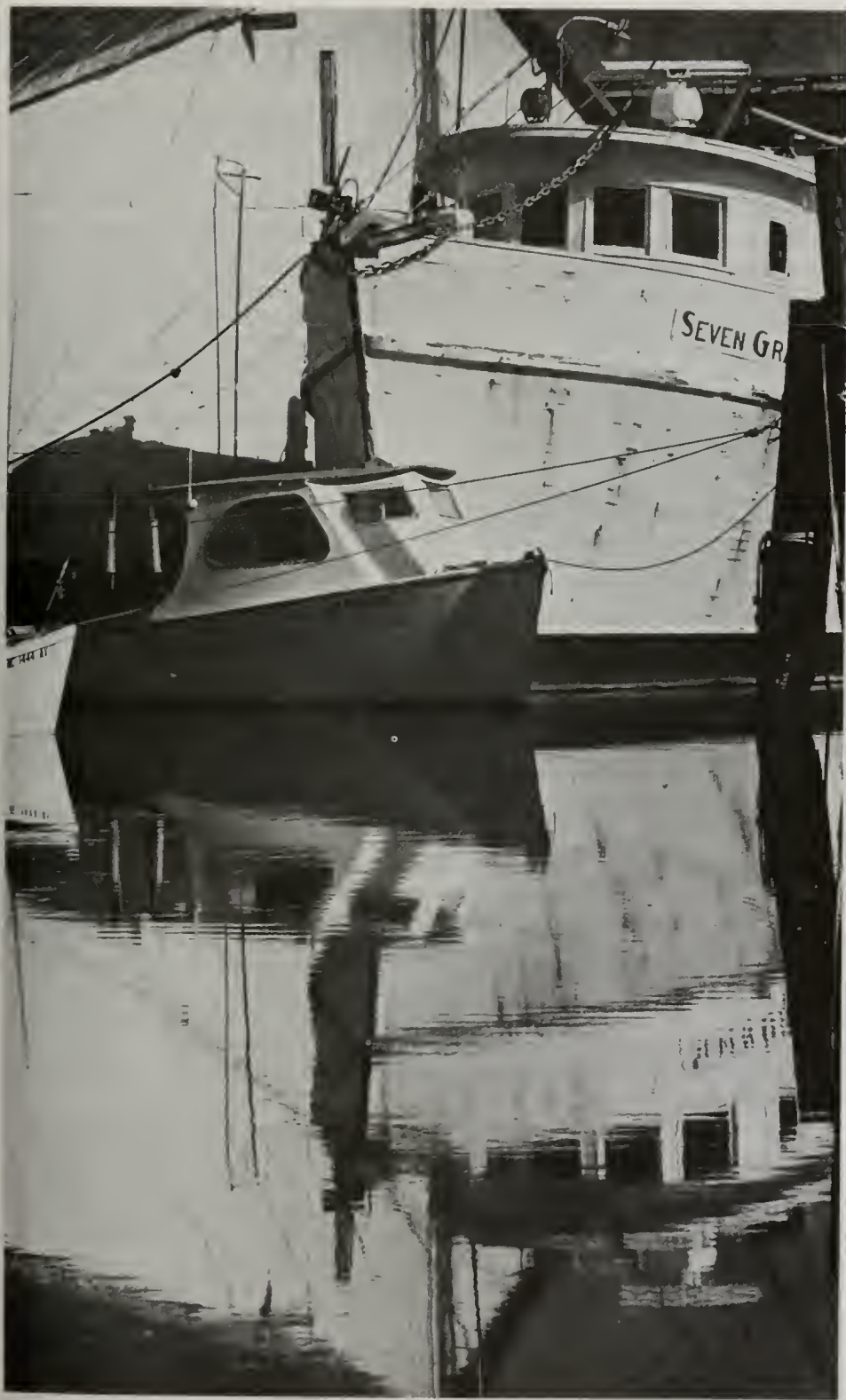
Searles, R. B. 1980. The strategy of the red algae life history. *Am. Nat.* 115:113–120.

Searles, R. B., and Leister, G. L. 1980. North Carolina marine algae. IX. *Onslowia endophytica* gen. et. sp. nov. (Phaeophyta, Sphacelariales) and notes on other new records for North Carolina. *J. Phycol.* 16:35–40.

Searles, R. B., and Schneider, C. W. 1980. Biogeography of the deep and shallow water seaweed floras of North Carolina. *Bull. Mar. Sci.* 30:732–736.

Dr. J. Bolling Sullivan. Comparative Protein Biochemistry.

The primary emphasis in the biochemical studies involves research on the structure, function, and evolution of protein molecules. Proteins, especially those involved in the transport of molecular oxygen (hemoglobin, hemocyanin, chlorocruorin, and hemerythrin), are being isolated and their structural and functional properties elucidated. These studies are intended to illustrate how protein molecules function, as well as how they have evolved. Studies of protein polymorphisms are intended to illustrate gene flow among populations and offer insights into the adaptive strategies of marine organisms.



Sullivan, B. 1980. Hemoglobin variation and its significance in fish. In *Workshop on Joint USSR-USA Research Program on Physiology and Biochemistry of Marine Animals*, eds. F. J. Vernberg and A. V. Zhirmunsky, pp. 179-186. University of South Carolina Press.

Sullivan, B., and Tentori, E. 1981. Genetics and evolution of the hemocyanin multigene. II. Absence of genetic variation in *Uca* from Mexico. *Comp. Biochem. Physiol.* 69B:897-899.

Dr. John Sutherland. Marine Ecology.

The research attempts to identify and understand the processes which result in the temporal and spatial patterns in species abundance in intertidal and subtidal, epibenthic communities. Changes in the adult populations are followed with point sampling and photographic techniques. The approach is experimental to the extent that species are removed or excluded from the community to assess their importance in community structure and function. This work was initiated with estuarine animal populations near Beaufort. Comparable work is now being done on the plant and animal populations in the rocky substrates of southern Chile and the Pacific coast of Central America.

Sutherland, J. P. 1981. The fouling community at Beaufort, North Carolina: a study in stability. *Am. Nat.* 118:499-519.

Moreno, C. A., and Sutherland, J. P. 1981. Physical and biological processes in a *Macrocystis pyrifera* community near Valdivia, Chile. *Oecologia* (In press.)

Dr. Joseph Ustach. Marsh Ecology.

Structure and functioning of wetlands, especially salt marshes, within the estuarine system. Major areas of interest are: primary production; decomposition; detritus formation and utilization; habitat utilization; microbial-meiofaunal interactions.

Ustach, J. F. 1982. Algae, bacteria and detritus as foods for the harpacticoid copepod, *Heteropsyllus pseudonunni* Coull and Palmer. *J. Exp. Mar. Biol. Ecol.* (In press.)

Heinle, D. R.; Flemer, D. A.; and Ustach, J. F. 1976. Contribution of tidal marshlands to mid-Atlantic estuarine food chains. In *Estuarine Processes*, ed. M. Wiley, pp. 309-320. New York: Academic Press.

Research Facilities

Visiting investigators may obtain research space throughout the year. Each research laboratory building is air-conditioned and equipped with running sea-water through a P.V.C. system. There are tanks, water tables, aquaria, autoclaves, ovens, and plant presses. In addition to commonly used laboratory equipment, the following are available: refrigerated centrifuges, spectrophotometer, balances, pH meters, hoods, and constant temperature equipment. The laboratory also maintains darkrooms, a well-equipped workshop, a stock room and a purchasing department.

I. E. Gray Library-Auditorium. Located in the building are the 1,917 square feet auditorium, with stage, a library, the librarian's office, two seminar rooms, a receiving room, a kitchenette, and two closed carrels. The auditorium has a seating capacity of approximately 300 and is suitable for lectures, seminars, symposia, and small regional or national meetings. Inquiries concerning use of auditorium or seminar room space should be addressed to Personnel and Auxiliaries, Duke University Marine Laboratory, Beaufort, North Carolina 28516.

The building houses the Pearse Memorial Library which contains 5,100 catalogued reference books and journals, 150 current journals, and 23,000 reprints. There are also expedition reports in oceanography, a microfilm library of graduate student theses based on research at the laboratory, and a microfilm reader. Other

materials may be obtained by special delivery system from the Perkins Library on the Durham campus or through the interlibrary loan service with other libraries in the United States.

Reference Collections. A reference collection of approximately 2,000 species of animals and macroalgae from coastal North Carolina is available to students and research personnel. A library of monographs, identification guides, and checklists of marine organisms is maintained. The museum serves as a clearing house for information on natural history, providing visitors with access to information on identification and availability of local marine organisms.

Computing Facilities. The Duke University Marine Laboratory operates a Digital Equipment Corporation PDP-11/34 minicomputer for use by staff, students, and visiting investigators. The computer has 120K of memory and is generally operated under Multi-User BASIC, a programming language that can be mastered with a relatively short time commitment. The operating system has three disks, used for mass data storage and rapid access of files and data. A dual cassette system is also available that provides for permanent data storage. There are two graphics terminals and three hard-copy terminals, one of which serves as a high speed line printer.

R/V Cape Hatteras. The Duke/University of North Carolina Oceanographic Consortium operates a 131-foot research vessel, the R/V *Cape Hatteras*, a coastal zone research vessel. The ship operates primarily in the western North Atlantic, concentrating in the region between Nova Scotia and the Caribbean. The ship is a member of the academic research fleet supported by the National Science Foundation for the purpose of providing ship time to investigators who have NSF research grants. Investigators supported by other agencies may use the R/V *Cape Hatteras* on the condition that the agency pay ship costs. Inquiries concerning use of the research vessel should be addressed to the Duke/UNC Oceanographic Consortium, Marine Laboratory, Duke University, Beaufort, North Carolina 28516.

Financial Information

Figures quoted in this section are projections and may be subject to change in many cases without prior notice. All rates are effective 10 May 1982 to 9 May 1983.

Room and Board Costs. All Duke University Marine Laboratory visitors who stay on the island will pay a room and board fee as follows: \$17.90 per day (1-6 days); \$15.10 per day (7+ days); \$105 per week (7+ days). Allowances will be made only for meals missed at the beginning and end of the stay.

Boat Rentals. The following boats are available at the laboratory for collecting and instructional activities. Charges apply to all research and teaching activities.

Boat Type	Charges
50 ft. cruiser/trawler (<i>First Mate</i>)*	approximately \$45.00+ per hour
20 ft. outboard runabouts	\$19.00 per hour
16 ft. outboard runabout	\$12.00 per hour
Outboard skiffs	\$3.50 per hour plus fuel costs

* Crew required for safety of user and vessel

These rates are intended to partially defray the cost of operating and maintaining these boats.

Most of these boats may be scheduled by visiting researchers through the maintenance office; however, first priority must be given to classes when they are in session. Use of Duke University Marine Laboratory vessels for any sponsored research will be subject to charges. If crew overtime is involved before or after a normal work day and any time Saturday or Sunday or Duke University holiday, the following charges will apply from 10 May 1982 to 9 May 1983: master, \$14.10 per hour; winch operator/mate, \$11 per hour.

Research Space. Research space, including seawater tables, is available on a limited basis for Duke University Marine Laboratory visitors. Research space rent for all users is \$2.25 per square foot per month. Typical size of laboratory-office area is 100 square feet. Requests for laboratory space, office space, and/or seawater tables should be sent to Personnel and Auxiliaries, Duke University Marine Laboratory, Beaufort, North Carolina 28516.

Teaching Space. Various size classrooms are available throughout the year; however, first priority must be given to Marine Laboratory classes when they are in session. Costs for such space are as follows: Lab 1 East—\$35/day, Lab 1 West—\$35/day; Lab 2—\$30/day; Lab 3—\$25/day; Lab 5 Main—\$35/day, Lab 5 Attic—\$25/day. Requests for these teaching areas, including class needs such as seawater tables, collecting equipment, etc., should be sent to Personnel and Auxiliaries, Duke University Marine Laboratory, Beaufort, North Carolina 28516.







APPLICATION FOR ENROLLMENT IN THE DUKE UNIVERSITY MARINE LABORATORY
UNDERGRADUATE MARINE SCIENCES PROGRAM

Please type or print. Please specify: spring term fall term

Date

1. Mr., Ms.
Last First Middle

2. Social Security Number

3. Date of Birth: Month Day Year

4. A. Current mailing address:
Street or P.O. Box
City State Zip
Area Code Telephone Number

B. Permanent or home address:
Street or P.O. Box
City State Zip
Area Code Telephone Number

5. Name and address of next of kin:
Name Relationship
Street or P.O. Box
City State Zip
Area Code Telephone Number

6. Special student:
A. Name and address of home institution:
.....
City State Zip
B. Major department Class

C. List courses currently in progress (which would not yet appear on a transcript):
.....
.....
.....
.....

D. If you wish credit certified to some agency or school, transcripts may be obtained from the
Office of the Registrar, 103 Allen Building, Duke University, Durham, North Carolina 27706.

7. The following persons have been requested to mail letters of recommendation to the admissions
office of the laboratory:
A. Name Position

City State Zip

Area Code Telephone Number

B. Name Position

.....

City State Zip

Area Code Telephone Number

8. Transcript(s) will be sent by the following institution(s):

.....

.....

.....

9. Have you ever been placed on probation or suspended or dismissed from any school?

Yes ☐ No ☐ (If yes, please explain below.)

Mail application to:

**Admissions
Duke University Marine Laboratory
Beaufort, North Carolina 28516**

APPLICATION FOR ENROLLMENT IN THE DUKE UNIVERSITY MARINE LABORATORY
SUMMER SESSION

Fill out completely; type or print.

Date

Mr., Ms.
Last First Middle

Date of Birth: Month Day Year

Social Security Number

Current Address:

Street

Rural Route or P.O. Box

City State Zip

Area Code Telephone Number

Forwarding Address:

Street

Rural Route or P.O. Box

City State Zip

Area Code Telephone Number

DUKE STUDENT

Undergraduate: ☐ Trinity ☐ Engineering ☐ Nursing

Graduate: ☐ Grad. Sch. Arts & Sci. ☐ Forestry ☐ Nursing ☐ Divinity
☐ Fuqua Sch. of Bus.

List current level, e.g., junior, senior, 1st year M.S., etc.

List major

NON-DUKE STUDENT (Attending Summer Session only)

Unclassified: ☐ Prebaccalaureate; list current level

☐ Postbaccalaureate; list current level

List major:

If presently attending, list name and address of school:

.....

Have you previously attended Duke: ☐ NO; ☐ YES (Give dates):

Have you received a degree from Duke: ☐ NO; ☐ YES (Give date):

ALL STUDENTS

List courses currently in progress (which would not yet appear on a transcript):

.....

.....

.....

.....

List other colleges and/or universities attended and degrees received:

EACH APPLICANT IS REQUIRED TO COMPLETE AND SUBMIT THIS APPLICATION BLANK AND TRANSCRIPTS OF ACADEMIC WORK COMPLETED TO DATE TO THE ADMISSIONS OFFICE. NOTE: A maximum of one 6 graduate unit or 1½ course program will be permitted per term (unless appropriate approval is otherwise obtained); first and second choices should be indicated. List course(s) desired below:

FIRST TERM:

Course Number

Course Title

1.

2.

(DUKE STUDENTS ONLY) Approval of assigned advisor; after May 3, Dean's approval required.

Signature Date

SECOND TERM:

Course Number

Course Title

1.

2.

(DUKE STUDENTS ONLY) Approval of assigned advisor; after May 3, Dean's approval required.

Signature Date

THIRD TERM:

Course Number

Course Title

1.

2.

(DUKE STUDENTS ONLY) Approval of assigned advisor; after May 3, Dean's approval required.

Signature Date

IMPORTANT NOTE: If you wish credit certified to some agency or school after completion of the program, AN OFFICIAL TRANSCRIPT OF YOUR WORK MAY BE OBTAINED UPON YOUR REQUEST FROM THE OFFICE OF THE REGISTRAR, 103 ALLEN BUILDING, DUKE UNIVERSITY, DURHAM, NORTH CAROLINA 27706. The Marine Laboratory issues NO transcripts or student grade reports.

Mail Application to:

Admissions

Duke University Marine Laboratory

Beaufort, North Carolina 28516

Although this is not part of the official application which you are filling out, and in no way will affect your application to the current program, we would consider it extremely helpful if you could provide us with the information requested below.

How did you learn about this program (e.g., program flyer, Marine Laboratory Bulletin, other students who have previously attended, your professor, etc.—please specify)?

What would you consider to be *the best way* to advertise the summer program in order to reach the maximum number of students at your home institution? (Please specify form of advertisement, e.g., flyer, bulletin, ad in magazine or newsletter, etc.)

APPLICATION FOR ENROLLMENT IN THE DUKE UNIVERSITY MARINE LABORATORY
UNDERGRADUATE MARINE SCIENCES PROGRAM

Please type or print. Please specify: spring term fall term

Date

1. Mr., Ms.
Last First Middle

2. Social Security Number

3. Date of Birth: Month Day Year

4. A. Current mailing address:
Street or P.O. Box
City State Zip
Area Code Telephone Number

B. Permanent or home address:
Street or P.O. Box
City State Zip
Area Code Telephone Number

5. Name and address of next of kin:
Name Relationship
Street or P.O. Box
City State Zip
Area Code Telephone Number

6. Special student:
A. Name and address of home institution:
.....
City State Zip

B. Major department Class

C. List courses currently in progress (which would not yet appear on a transcript):
.....
.....
.....
.....

D. If you wish credit certified to some agency or school, transcripts may be obtained from the
Office of the Registrar, 103 Allen Building, Duke University, Durham, North Carolina 27706.

7. The following persons have been requested to mail letters of recommendation to the admissions
office of the laboratory:
A. Name Position
.....

City State Zip

Area Code Telephone Number

B. Name Position

.....

City State Zip

Area Code Telephone Number

8. Transcript(s) will be sent by the following institution(s):

.....

.....

.....

9. Have you ever been placed on probation or suspended or dismissed from any school?

Yes ☐ No ☐ (If yes, please explain below.)

Mail application to:

Admissions
Duke University Marine Laboratory
Beaufort, North Carolina 28516

APPLICATION FOR ENROLLMENT IN THE DUKE UNIVERSITY MARINE LABORATORY
SUMMER SESSION

Fill out completely; type or print.

Date

Mr., Ms.
Last First Middle

Date of Birth: Month Day Year

Social Security Number

Current Address:

Street

Rural Route or P.O. Box

City State Zip

Area Code Telephone Number

Forwarding Address:

Street

Rural Route or P.O. Box

City State Zip

Area Code Telephone Number

DUKE STUDENT

Undergraduate: ☐ Trinity ☐ Engineering ☐ Nursing

Graduate: ☐ Grad. Sch. Arts & Sci. ☐ Forestry ☐ Nursing ☐ Divinity
☐ Fuqua Sch. of Bus.

List current level, e.g., junior, senior, 1st year M.S., etc.

List major

NON-DUKE STUDENT (Attending Summer Session only)

Unclassified: ☐ Prebaccalaureate; list current level

☐ Postbaccalaureate; list current level

List major:

If presently attending, list name and address of school:

Have you previously attended Duke: ☐ NO; ☐ YES (Give dates):

Have you received a degree from Duke: ☐ NO; ☐ YES (Give date):

ALL STUDENTS

List courses currently in progress (which would not yet appear on a transcript):

.....
.....
.....
.....
.....

List other colleges and/or universities attended and degrees received:

EACH APPLICANT IS REQUIRED TO COMPLETE AND SUBMIT THIS APPLICATION BLANK AND TRANSCRIPTS OF ACADEMIC WORK COMPLETED TO DATE TO THE ADMISSIONS OFFICE. NOTE: A maximum of one 6 graduate unit or 1½ course program will be permitted per term (unless appropriate approval is otherwise obtained); first and second choices should be indicated. List course(s) desired below:

FIRST TERM:

Course Number

Course Title

1.
2.

(DUKE STUDENTS ONLY) Approval of assigned advisor; after May 3, Dean's approval required.

Signature Date

SECOND TERM:

Course Number

Course Title

1.
2.

(DUKE STUDENTS ONLY) Approval of assigned advisor; after May 3, Dean's approval required.

Signature Date

THIRD TERM:

Course Number

Course Title

1.
2.

(DUKE STUDENTS ONLY) Approval of assigned advisor; after May 3, Dean's approval required.

Signature Date

IMPORTANT NOTE: If you wish credit certified to some agency or school after completion of the program, AN OFFICIAL TRANSCRIPT OF YOUR WORK MAY BE OBTAINED UPON YOUR REQUEST FROM THE OFFICE OF THE REGISTRAR, 103 ALLEN BUILDING, DUKE UNIVERSITY, DURHAM, NORTH CAROLINA 27706. The Marine Laboratory issues NO transcripts or student grade reports.

Mail Application to:

Admissions

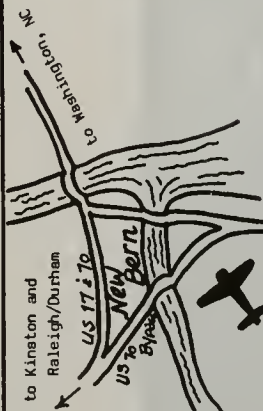
**Duke University Marine Laboratory
Beaufort, North Carolina 28516**

Although this is not part of the official application which you are filling out, and in no way will affect your application to the current program, we would consider it extremely helpful if you could provide us with the information requested below.

How did you learn about this program (e.g., program flyer, Marine Laboratory Bulletin, other students who have previously attended, your professor, etc.—please specify)?

What would you consider to be *the best way* to advertise the summer program in order to reach the maximum number of students at your home institution? (Please specify form of advertisement, e.g., flyer, bulletin, ad in magazine or newsletter, etc.)





Duke University Marine Laboratory

Rivers Island
Beaufort, North Carolina 28516

MILEAGES FROM DUMI ID:

- New Bern Airport - 37.5
- Jacksonville Airport - 60
- Kinston Airport - 80
- Wilmington Airport - 85
- Raleigh/Durham Airport - 160
- Durham - 180

*stoplight at Atlantic Beach bridge - 3

MOTELS/POINTS OF INTEREST:

- 1-Fort Macon
- 2-Oceana
- 3-Landmark Inn
- 4-Sea Hawk
- 5-Holiday Inn
- 6-Atlantis
- 7-John Yancey
- 8-Whaler
- 9-Iron Steamer
- 10-Ramada Inn
- 11-Islander
- 12-NC Marine Resources Center

Havelock

NC 101

US 70

Morehead City

NC 24

to Jacksonville

Bogue Sound

Beaufort

Rivers Island

DUMI

Newport River

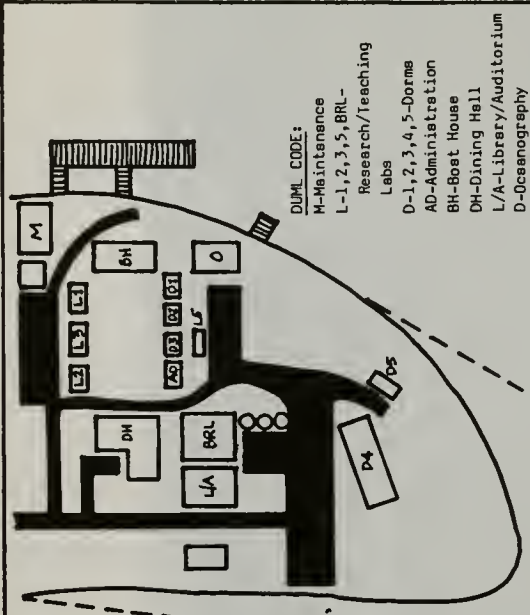
US 70

Harkers Island



Atlantic Beach

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12



DUMI CODE:

- M-Maintenance
- L-1, 2, 3, 5, BRL-Research/Teaching Labs
- D-1, 2, 3, 4, 5-Dorms
- AD-Administration
- BH-Boat House
- DH-Dining Hall
- L/A-Library/Auditorium
- D-Oceanography

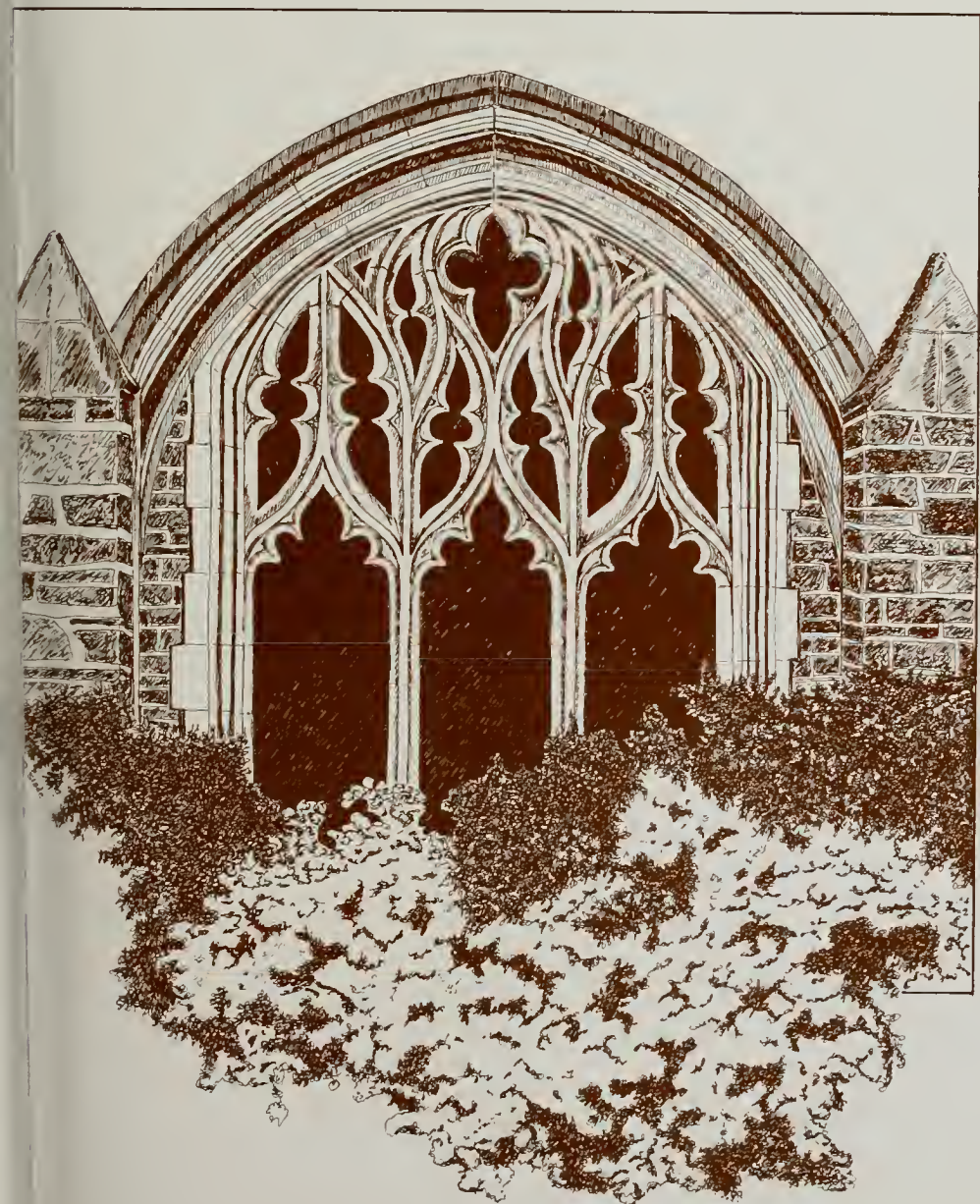
to Ocracoke



Bulletin of Duke University
(USPS 073-680)
Durham, NC 27706

bulletin of
Duke University 1983-84

Graduate School



bulletin of

Duke University 1983-84

Graduate School

EDITOR
Judy A. Beck
SENIOR EDITORIAL ASSISTANTS
Elizabeth Matheson
Deborah A. Earnhardt

ACADEMIC LIAISON
Frances C. Thomas
Assistant Dean

PHOTOGRAPHS
Thad Sparks
Jimmy Wallace

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The information in the bulletin applies to the academic year 1983-84 and is accurate and current, to the best of our knowledge, as of March 1983. The University reserves the right to change programs of study, academic requirements, lecturers, teaching staffs, the announced University calendar, and other matters described in the bulletin without prior notice, in accordance with established procedures.

Duke University does not discriminate on the basis of race, color, national and ethnic origin, sex, handicap, or age in the administration of educational policies, admission policies, financial aid, employment, or any other University program or activity. It admits qualified students to all the rights, privileges, programs, and activities generally accorded or made available to students. For further information, contact Dolores L. Burke, Equal Opportunity Officer, (919) 684-8111.

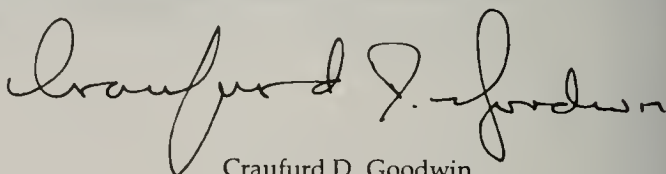
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To the Prospective Graduate Student

From its beginning Duke University has maintained a first-rate Graduate School. This, we believe, is where excellence is established and where the two essential functions of a university, teaching and research, truly come together. Over the years Duke's strength at the graduate level has grown in all the main fields of knowledge. The faculty enjoys international distinction. The laboratories, libraries, and computer facilities are among the very best. Yet the Graduate School remains small enough so that personal contact is a central feature of our programs, and fruitful interaction across disciplines is a common experience.

We are confident that for the student in search of a fine graduate education Duke University has much to offer. This is a community in which minds and ideas grow. We provide training for many careers, but we seek also to stimulate personal creativity and to provide congenial surroundings in which education and research are both productive and pleasant.

We hope that the following pages will provide you with the information you require in making the important choice of the course of your graduate education, and we look forward to welcoming you to the Duke community.

A handwritten signature in black ink, reading "Craufurd D. Goodwin". The signature is fluid and cursive, with the first name "Craufurd" being more prominent and the last name "Goodwin" following in a similar style.

Craufurd D. Goodwin
Dean of the Graduate School





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*Term expires September 1983.



Introduction

A Community of Scholars

Writing in the 1920s the philosopher and man of science, Alfred North Whitehead, defined the purpose of a university in these terms: "The justification of a university is that it preserves the connection between knowledge and the zest for life, by uniting the young and the old in the imaginative consideration of learning." If this is true of a university generally, it is true of a graduate school especially. Faculty members and graduate students work together in the imaginative recasting of ideas necessary for successful research and the development of human knowledge.

Ideally, a graduate school is a community of scholars engaged in imparting and extending the realm of human knowledge in the arts and sciences. A select group of students is admitted each year to undergo the rigorous discipline of an advanced degree program, the successful among them to emerge as scholars of promise. To enter into graduate education today is to accept a real challenge, but this decision should not be made casually. The work toward a doctorate requires several years of tireless effort and possible sacrifice, and the material rewards may be less certain than in some alternative endeavor. However, pursued with determination, graduate education can be the doorway to a stimulating, creative, and meaningful life. The student who is contemplating this challenge may have many questions in mind; the mate-

rial that follows is an attempt to answer some of them.

The Decision to Go to Graduate School

The decision to work toward an advanced degree must be a personal commitment born of a willingness to devote oneself to many months or possibly years of academic discipline just at an age when one may be impatient for financial independence and freedom from academic discipline. Graduate education requires all the energy, enthusiasm, and self-discipline at one's disposal; to enter into it half-heartedly is to invite discouragement or failure.

An equally important requisite for success in graduate study is the possession of a natural curiosity and the capacity for self-discipline. A good undergraduate record may or may not be adequate evidence of these characteristics. Many students with excellent undergraduate records have been unsuccessful in graduate study because their undergraduate training stressed an ability to marshal facts and to articulate these facts rather than real understanding and analysis of material. On the other hand, many distinguished scholars had undistinguished undergraduate records. In gaining admission to a graduate school, the undergraduate record is, of course, an important element, but usually some margin is left to allow for students who

develop serious academic interests late in their undergraduate careers. Students are often best able to judge for themselves whether or not their grades are a true gauge of their ability.

There is no unerring way of knowing in advance whether one will be successful or happy in graduate school. It is quite likely, however, that if one has both the motivation and ability and does not try it, there will be regrets in later years. Although the decision must be an individual choice, superior intellectual ability is a scarce human resource, and the encouragement and utilization of it is a matter of community as well as personal concern.

Choosing a Graduate School

Over 250 universities today offer work leading to the Ph.D. degree. Among these are about 60 institutions which grant only two or three such degrees a year in all fields combined. At the other end of the scale are about 50 universities which account for nearly 70 percent of all doctorates granted in this country. Duke University is among the latter, as are most of the major institutions which offer programs ranging the breadth of academic disciplines. But even if one can narrow the field to about 50 major institutions, how does one select among these, and what factors should affect one's final choice? A few key factors are discussed briefly below.

Size. Size is not an infallible guide to the quality of a graduate school. There are a number of poor graduate schools of exceedingly large size and a number of extremely good small ones. However, it might be helpful simply to mention a few of the disadvantages of too many or too few students.

An extremely large graduate school—there are some which have between 6,000 and 12,000 enrolled—is not the ideal of a small number of superior students working closely in intellectual pursuits with a few esteemed scholars. Classes of 50 to 100 students, inaccessibility of senior faculty, shortage of library materials and facilities, and only a nodding acquaintance

with fellow students are a few of the possible drawbacks. An able student may develop well even in this atmosphere of mass production, but it is hardly the ideal.

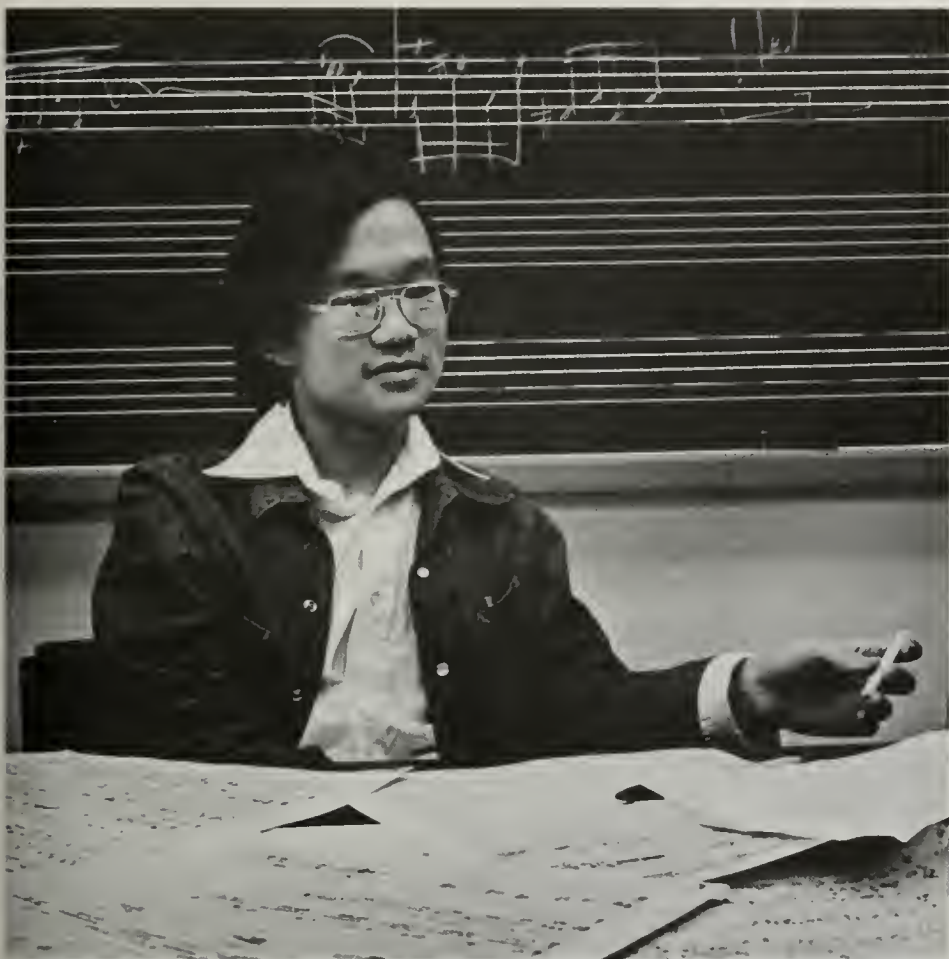
An extremely small graduate school also has its disadvantages. Facilities are often limited, and the faculty is likely to be primarily composed of undergraduate instructors. A university must be willing to commit a significant portion of its resources to develop a graduate program of high quality and this is often not the case in an extremely small graduate school.

More important than the size of the entire graduate school is the size of the particular departmental program in which a student is interested. An optimum doctoral program will have an enrollment of perhaps 30 to 100 students, admitting 15 to 40 new students each year, and turning out perhaps three to ten Ph.D.'s per year. This information is usually available in university catalogues or government publications on higher education.

Duke University is committed to programs of moderate size in which the interests of the student are important. Total enrollment in the Graduate School is 1,503 students. Between 400-450 new students are admitted each year from approximately 2,800 applications. Only two departments have more than 80 students; nineteen departments have enrollments that fall within the optimum range suggested in the preceding paragraph.

Quality. Not only do universities differ considerably in their reputation for quality, but there are marked differences among departments within any university. Many excellent universities have a few weak departments in which a student would fare less well than in an excellent department in a less esteemed institution. Therefore, the student should not be guided solely by the reputation of a university as a whole, but should inquire more specifically about the area of specialization.

Since judging the quality of a graduate program is necessarily subjective, no two people are likely to be in complete agreement. Prospective students would do well to talk with their undergraduate



professors, particularly those who have themselves achieved some reputation in the world of scholarship. As witnessed by their own continuing writing and research, they are more likely to have reliable information on the merits of various graduate programs. Similarly, younger faculty members who are only four or five years out of graduate school may have more recent acquaintance with their own and other schools.

Another guide may be occasional questionnaires asking other educators to rank various graduate departments.

Alone, none of these guides is adequate; however, in conjunction with individual advice and recommendations, they can serve as useful indicators. In summary, the best procedure is to take as many factors as possible into account, and

then to apply to three or four of the schools high in consideration. (Applying to fifteen universities is a waste of an applicant's and the universities' time.) Write to the graduate school or to the departmental Director of Graduate Studies if further information is desired; visit the university in person, if possible; and carefully weigh the advice of distinguished faculty members of one's undergraduate college.

Duration of Program

The length of time a graduate student spends in study toward an advanced degree depends upon the requirements of the individual program, on personal work habits, and on the environment of the graduate school and the department in which the study is conducted.

The student's level of preparation before entering graduate school has a direct bearing on the speed with which the degree may be earned. A student who enters with proficiency in one or more foreign languages, and a good foundation in the chosen field may well be able to finish within the minimum time limits. On the other hand, the student who is not as well prepared may find that one and a half to two years are the minimum for the A.M. degree, and four to five years for the Ph.D. degree (although wise use of the summers may reduce this time somewhat). The total time may also be lengthened if the student must work during part of the period of residence.

The attitude of the graduate school and its various departments will also affect the time needed to complete the de-

gree. During the last decade the average time elapsing between entering graduate school and receiving the doctorate in American universities has been about ten years. A study of experience at Duke in 1979 indicated that the average doctorate in the humanities required a little over seven years, nearly six years in the social sciences, and slightly over four years in the sciences. Over the last few years, however, Duke University has been among the forerunners in reducing the time needed to obtain the Ph.D. without any sacrifice in quality. The effort has taken the form of trying to eliminate the unnecessary delays, particularly those due to financial burdens on the student. Duke ranks among the leading institutions in the country today in terms of financial aid per student from university sources.



Moreover, much of this aid is in the form of fellowships and scholarships which do not require burdensome services in return. The large public institutions are often more restricted to awards which require substantial teaching, research, or other duties, thus reducing the speed with which a student can complete the resident course work. A student will be wise to inquire to what extent progress toward a degree may be delayed by the work entailed in certain awards. If, for example, an assistantship lengthens unduly the time necessary to obtain a degree, a smaller fellowship may be preferable.

Another way in which Duke encourages deliberate speed toward fulfilling degree requirements is through its tuition charges. Many graduate schools charge tuition for three full years in a doctoral program. In 1958 Duke adopted the policy of charging full tuition and fees only up to the time the doctoral student passes the preliminary examination. (This examination is taken upon completion of all course and language requirements, usually at the end of the second year, before

the student is formally admitted to candidacy for the Ph.D.) After "prelims," tuition charges are substantially reduced. In choosing a graduate school, a prospective student should inquire about the fees for a full doctoral program, not merely the charges for the first year. The tuition and fee system at Duke has worked to encourage both students and their departments to arrange for preliminary examinations to be taken before the beginning of the third year. Some years ago fewer than half of the doctoral students at Duke took this examination before the beginning of the third year; today over 90 percent are doing so. This plan, aided by scholarship and fellowship aid, gives graduate students at Duke a marked advantage over their counterparts in many other graduate schools in acquiring their degrees in the minimum amount of time.

The duration of the graduate program, therefore, depends on many factors, but the policy of the Duke Graduate School is to keep the length of time a student is involved in obtaining an advanced degree at a minimum.



Duke University Graduate School

Teaching and Research

In surveying the progress made in the first seven years after the founding of Duke University, its first President, William Preston Few, wrote that he wanted "to see the Graduate School made strong because it will best and most quickly insure our attaining and maintaining a place of real leadership in the educational world." President Few believed that "more than anything else here our Graduate School will determine the sort of University we are to build and its standing in the educational world." These opinions have continued to prevail to the present day, with emphasis upon the interdependence of teaching and research as the necessary components of scholarship.

Over 700 members of the graduate faculty teach the approximately 900 courses and seminars offered in the Graduate School and supervise thesis and dissertation research. Many of the major universities of the world have helped to train this faculty; approximately 90 percent of the graduate staff hold degrees from the 52 institutions which make up the Association of Graduate Schools within the Association of American Universities. By place of birth, the faculty represent almost every state in the nation and almost two dozen foreign countries.

The 1,503 graduate students currently enrolled represent a similar diversity of background. Approximately 45 percent of the students are from under-

graduate institutions in the Southeast, 30 percent from New England and the Northeast, 9 percent from the Midwest, 2 percent from the Northwest, 7 percent from the Southwest, and 7 percent from foreign countries.

The groundwork for learning may be laid in privacy—indeed a certain amount of private study and research is absolutely essential—but the vital stimulus to the learning process comes from one's contact with the minds of other people with similar or related interests. This is precisely why graduate schools are highly selective in their admissions policy, and it is one of the important reasons for their willingness to offer attractive fellowship awards to outstanding students. The superior student is a valuable catalyst both for fellow students and for faculty and is prized as such.

Faculty and students comprise the essential human factors in education, but their joint endeavor cannot prosper without adequate research and library facilities. Duke University has research facilities for physics, botany, zoology, chemistry, psychology, sociology, engineering, and biochemistry. These laboratories have been built entirely within recent years, and modernization and expansion have occurred in other scientific areas. The University has an excellent Computation Center on the campus and shares a computing facility with the University of North Carolina and North Carolina State Uni-

versity. The Triangle Universities Computation Center is among the largest research-oriented computer facilities in the world. The University has a fine research library. In number of volumes, serials, and documents, and breadth of coverage, it is a much more adequate library than that available in many graduate schools with an enrollment two or three times as large. To the student in the arts, humanities, or social sciences, this is an immeasurable asset.

Among the many special features of the Graduate School a few important examples may be mentioned. For students in the biological and physical sciences, the facilities of the Duke Marine Laboratory at Beaufort, North Carolina, are available for course work and research. The laboratory has research buildings, classrooms, research vessels, and living quarters which make it an excellent research center in marine biology. Closer to home are the 8,300 acres of Duke Forest, managed by the School of Forestry and Environmental Studies, ideal for research on timber growth, soils, and related topics. A regional nuclear structure laboratory is housed on the campus and serves the major universities in the area. The phytotron, adjacent to the botany greenhouses, is an integrated series of plant-growth rooms, chambers, and greenhouses, with forty-six separately controlled environments providing more than 4,000 square feet of plant-growing space. The factors of the environment controlled in the units to study plant growth include light, temperature, nutrients, carbon dioxide concentration, and humidity.

Additional resources and facilities are available to the graduate student because of Duke's fine Schools of Law, Business, Medicine, Engineering, Forestry and Environmental Studies, and the Divinity School. A two-term summer session and the availability of courses at the nearby University of North Carolina at Chapel Hill, North Carolina Central University in Durham, and North Carolina State University in Raleigh, under a cooperative arrangement, offer other opportunities to the graduate student.

No description of programs can begin to give the prospective student the full flavor of graduate study in a particular institution. A visit to the universities in which one is interested may be helpful in giving one a better picture. If this should be practical, the Duke Graduate School offers a warm invitation to prospective students to come to the campus during the year to discuss their possible application and admission. The visitor will find at Duke most of the facilities that one could hope for in the largest of institutions, and yet the University has been fortunate in avoiding many of the evils inevitable with mass education. Despite the total University enrollment of approximately 9,500, Duke has retained the sense of community that one usually associates with a small liberal arts college. And in an age when current architectural whim often adds yet one more variant style to an already assorted array of buildings, Duke has built a campus of unusual and architecturally coherent beauty. This, too, is an important part of education, creating an environment conducive to learning.

Special Programs

Center for the Study of Aging and Human Development. The primary aims of the center are to encourage and support basic and applied research on biomedical, behavioral, and social scientific aspects of adult development and aging; to train investigators for such research; to provide clinical training in geriatrics for health professionals; and to develop sources of scientific information which are accessible to interested individuals, organizations, and governmental agencies. Although the center does not offer degrees, the varied programs, research laboratories, and clinical settings provide a context and resource for undergraduate and graduate students and for health professionals with special interests in adult development and aging. Inquiries should be addressed to the Director, Center for the Study of Aging and Human Development, Box 3003, Duke University Medical Center, Durham, North Carolina 27710.



Asian-Pacific Studies Institute. The purpose of the Asian-Pacific Studies Institute is to encourage and support advanced training in Asian-Pacific studies and in Chinese, Japanese, and eventually other Asian-Pacific languages. Fellowships provide both tuition and a living stipend up to the James B. Duke award amounts for a two-year period. Fellows will be expected to reach the equivalent of third-year level of proficiency of language training during the term of the award. Incoming graduate students with the Ph.D. as their objective, students in good standing in the first year of study in Duke professional schools, and current Duke students enrolled in Ph.D. programs may be considered for Asian-Pacific Studies Institute fellowships. Further information may be obtained from the Director, Asian-Pa-

cific Studies Institute, 2101 Campus Drive, Duke University, Durham, North Carolina 27706.

Canadian Studies Program. The purpose of this program is to increase American knowledge and understanding of Canada by formalizing and expanding graduate interest in Canada, introducing the study of Canadian life and culture at the undergraduate level, and encouraging such study in primary and secondary schools. The program awards a limited number of graduate fellowships and teaching assistantships for the study of Canada by American residents at Duke who are working in their departments on a Canadian topic for their dissertations; sponsors lectures by Canadian specialists; and supports seminars devoted to Canada, held off and on campus. Inquir-

ies should be addressed to the Director of Canadian Studies, Center for International Studies, 2122 Campus Drive, Duke University, Durham, North Carolina 27706.

The University Program in Cell and Molecular Biology. This program centralizes the cell, developmental, and molecular biology research training found in eight of the University's departments: anatomy, biochemistry, botany, microbiology and immunology, pathology, pharmacology, physiology, and zoology. Prospective students may either apply to one of the participating departments, or apply directly to the program and designate a departmental preference. Applications for admission and fellowship support must be received by February 1, but early applications may receive earlier consideration. Inquiries should be addressed to Dr. Bernard Kaufman, The University Program in Cell and Molecular Biology, Box 3711, Duke University Medical Center, Durham, North Carolina 27710.

Continuing Education. Local adult residents may pursue graduate academic study at Duke as nondegree students through the Office of Continuing Education, which will provide both academic and career counseling to such students. Information and applications may be obtained from the Office of Continuing Education, 107 Bivins Building, Duke University, Durham, North Carolina 27708.

Cooperative Programs with Neighboring Universities: Library Exchange. Through a cooperative lending program, graduate students of the University of North Carolina and Duke University are granted library loan privileges in both universities.

Cooperative Program in Russian and East European Studies. The graduate schools of Duke University and the University of North Carolina offer a cooperative program leading to the A.M. and Ph.D. degrees in several disciplines (economics, history, literature, linguistics, political science, and sociology), with a

concentration in Russian and East European studies. Students admitted to one institution are encouraged to enroll in courses advantageous to their program at the other institution, to utilize the libraries and facilities of both universities, and to participate in the periodic colloquia involving the personnel of the two institutions and distinguished visiting scholars. For information, contact Dr. Vladimir G. Treml, Department of Economics, Duke University, Durham, North Carolina 27706.

Center for Demographic Studies. The facilities of the center, located at 2117 Campus Drive, include a population library, the Joseph J. Spengler Collection of publications and research materials, and extensive data resources. These are available to the entire Duke community. The center does not offer degrees; it promotes the pursuit of advanced degrees, with a specialization in population studies, through either the Department of Sociology or the Department of Economics. The center's program provides opportunities for direct student participation in ongoing research projects. The program of extramural research stresses, but is not limited to, applied work in the demography of aging, health, mortality, fertility, and migration. Inquiries for training opportunities may be directed to Dr. George C. Myers, Director, Center for Demographic Studies, Box 4732 Duke Station, Duke University, Durham, North Carolina 27706.

Center for Environmental Engineering. The purposes of the Center for Environmental Engineering are to focus attention on pressing environmental problems, to provide orientation and educational opportunities in technical environmental subjects for both students and faculty, and to promote interdisciplinary environmental engineering research. The center sponsors a visiting speaker program, graduate and faculty seminars, and coordinates graduate and undergraduate courses in environmental engineering. Further information may be obtained by writing or visiting the Center for Environmental Engineering Office, 118 School

of Engineering, Duke University, Durham, North Carolina 27706.

The University Program in Genetics. This is an interdisciplinary program with a faculty drawn from several of the biological science departments (anatomy, biochemistry, botany, microbiology and immunology, zoology), and is designed to meet the needs of students with a variety of educational backgrounds and professional objectives who are interested in specializing in the field of genetics. Interested students should apply for admission to the department of their choice, and after being admitted make arrangements to participate in the program. For information, contact Dr. Nicholas W. Gillham, Director, The University Program in Genetics, 0082 Biological Sciences Building, Duke University, Durham, North Carolina 27706.

Master of Arts Program in Humanities. This interdepartmental program centered in the humanities and leading to the A.M. degree is designed for students whose interests cross disciplinary lines and are not easily met by departmental programs. Students select a set of thematically related courses from the graduate level offerings of humanities departments, and, where appropriate, from other departments as well. The interdepartmental committee which manages the program offers aid in tailoring a set of courses to the individual student's needs, approves the program chosen, and provides ongoing supervision. In addition, an introductory, noncredit seminar is planned as a shared experience for all students in the program. Further information may be obtained by writing Dr. Peter Burian, Director, Master of Arts Program in Humanities, 328 Carr Building, Duke University, Durham, North Carolina 27708.

Indian Ocean Studies Program. The purpose of this program is to encourage both scholarly research and graduate training in the political, historical, economic, and sociocultural development of the countries of the Indian Ocean region. The Departments of History, Anthropology, Political Science, Religion, Music,

Sociology, and Civil and Environmental Engineering, among others, actively cooperate with the program. Graduate students, in addition to meeting the requirements of the departments in which they are enrolled, are expected to take Hindi, Persian, Swahili, Arabic, or another Indian Ocean language appropriate to their research. Generally, field research which involves residence in an Indian Ocean country is expected for completion of the dissertation. The program sponsors a regular agenda of visiting speakers and scholarly presentations in its faculty/graduate student seminar, in addition to special research symposia and conferences. Inquiries should be addressed to the Chairman, Indian Ocean Studies Program, Center for International Studies, 2122 Campus Drive, Duke University, Durham, North Carolina 27706.

Duke University International House. The International House is the focal point for social and cultural programs planned especially for and by foreign students. It is a meeting place for all internationals studying or working at the University. An orientation to Duke and the Durham community is held prior to the start of classes each fall semester. Some of the programs sponsored by the International House include: the International Association, which consists of American and foreign students organized to foster mutual understanding among the students and staff from all nations represented in the Duke community through cultural and recreational activities; the Host Family Program, which offers all students the chance to become acquainted with an American family; the International Wives Club, which provides a structure for international women to meet with American women in an informal atmosphere; and the Speaker's Bureau, which provides an opportunity for internationals to share their cultures and customs with members of the Durham community through speaking engagements to city school classes, civic organizations, and social clubs.

The programs, available to all international visitors, facilitate intercultural

communication and provide a means for easy acculturation into American society. Address inquiries to Jean D. Wilbur, Director, International House, 2022 Campus Drive, Duke University, Durham, North Carolina 27706.

Islamic and Arabian Development Studies. This program, begun in 1977 with the assistance of grants from the government of Saudi Arabia and some twenty corporations in the United States, sponsors conferences and research on Islamic themes with special reference to developmental problems of the Arabian peninsula. The program provides a limited number of graduate fellowships as well as supporting courses and seminars on the language, literature, and contemporary problems of the Islamic world. It also sponsors an outreach program which includes Appalachian State University, Belmont Abbey College, the College of Charleston, Converse College, Davidson College, Johnson C. Smith University, Old Dominion University, and the University of the South. Inquiries should be addressed to Dr. Ralph Braibanti, Director, Islamic and Arabian Development Studies, 2114 Campus Drive, Duke University, Durham, North Carolina 27706.

Latin-American Studies Program. The Graduate School offers an interdepartmental program in Latin-American studies leading to the A.M. and Ph.D. degrees. Students may write their theses and take their degrees in anthropology, history, economics, political science, sociology, or Romance languages and literature. The purpose of the program is to provide a desirable combination of courses on Ibero-America in these disciplines and to give candidates more rigorous training in Latin-American studies. Inquiries should be directed to Dr. Arturo A. Valenzuela, Chairman, Council on Latin-American Studies, Center for International Studies, 2101 Campus Drive, Duke University, Durham, North Carolina 27706.

The Ph.D. Program in Literature. This program offers to qualified students the possibility of gaining unusually broad credentials with which to embark on a teaching career in established national lit-

eratures as well as programs linking literature to other fields. Study in depth through courses in a single national literature is combined with a series of four core courses, given in a two-year sequence, on the fundamental issues of literary theory, history, and criticism. All the literature departments cooperate in this program and its students have access to all courses given under the auspices of the graduate faculties in the humanities. Financial aid is available for qualified students in their first two years. In the third year all students will receive the opportunity to teach either English composition or elementary language instruction with the department of their chosen national literature. A full descriptive brochure is available. To obtain the brochure or other information, contact Dr. James Rolleston, Chairman, Committee for the Ph.D. in Literature, Department of Germanic Languages and Literature, 105 Language Building, Duke University, Durham, North Carolina 27706.

Medical Historian Training Program. Conducted under the auspices of the School of Medicine and the Graduate School, this program requires a minimum of six years of graduate study for the M.D.-Ph.D., and four or five years for the M.D.-A.M. The M.D.-Ph.D. program is intended for those students who know that their major career effort will be in teaching and other scholarly activities in the history of medicine (not necessarily to the total exclusion of clinical medicine). The M.D.-A.M., on the other hand, is appropriate for those who are undecided, but who wish to acquire a firm foundation for future study, or for those who are seriously interested in pursuing an avocation in the history of medicine. Applicants must meet the requirements for admission to the School of Medicine and the Graduate School in the Department of History. Inquiries should be addressed to Dr. John Crellin, Director, Medical Historian Training Program, Box 3702, Duke University Medical Center, Durham, North Carolina 27710.

Medical Scientist Training Program. This program is conducted under

the auspices of the Graduate School and the School of Medicine and is designed for students with a strong background in science who are motivated toward a career in the medical sciences and academic medicine. It provides an opportunity to integrate graduate education in one of the sciences basic to medicine with the clinical curriculum of the School of Medicine, and usually requires six to seven years of study leading to both the M.D. and Ph.D. degrees. Interested students should apply for admission to both the Graduate School and the School of Medicine. Additional information may be obtained by contacting Dr. Henry Kamin, Associate Director, Medical Scientist Training Program, Department of Biochemistry, Box 3711, Duke University Medical Center, Durham, North Carolina 27710.

Program in Medieval and Renaissance Studies. This program is administered by the Duke University Center for Medieval and Renaissance Studies. A participating student is enrolled in one of the regular departments and fulfills the Ph.D. requirements for that discipline while taking a program of electives which will advance his or her interdisciplinary competence in the medieval or Renaissance areas. Participation in the program will fulfill the requirement for work in a related field. Inquiries should be addressed to the Director of Graduate Studies, Duke University Center for Medieval and Renaissance Studies, Box 4666, Duke Station, Durham, North Carolina 27706.

The University Program in Neurobiology. This interdisciplinary program was developed in response to recent advances in neurobiology which have resulted in closer ties among the various approaches to studying the nervous system. The program is designed for students who wish to study the nervous system at several levels ranging from the molecular to the behavioral, and students will be advised to take courses in neuroanatomy, neurophysiology, neuropharmacology, and neuropsychology. The heart of the training is a research apprenticeship that leads to a Ph.D. dissertation. Each student must affiliate with one of the

participating departments—anatomy, biochemistry, microbiology and immunology, pathology, pharmacology, physiology, psychology, and zoology—and must meet the requirements of that department for the Ph.D. degree.

Prospective students may apply directly to the University Program in Neurobiology or to one of the eight participating departments. Those who apply to the program should designate the department of choice; those who apply to the department should indicate their interest in the University Program in Neurobiology. Inquiries should be directed to Dr. Irving T. Diamond, Director, The University Program in Neurobiology, Department of Psychology, Duke University, Durham, North Carolina 27706.

Oak Ridge Associated Universities. Duke University is one of the sponsoring universities of the Oak Ridge Associated Universities located at Oak Ridge, Tennessee. The graduate research program at Duke has available to it all the facilities of the Oak Ridge National Laboratory and the cooperative supervision of student research by the staff at Oak Ridge. Fellowships in several fields of science are available to qualified applicants. Further information may be obtained from Dr. Harold W. Lewis, Department of Physics, Duke University, Durham, North Carolina 27706.

Institute of Policy Sciences and Public Affairs. See Public Policy Studies in the chapter "Advanced Degree Programs" in this bulletin.

Center for Resource and Environmental Policy Research. Housed in the School of Forestry and Environmental Studies, the center was established to provide an academic center of excellence for the analysis of contemporary resource and environmental policy issues, a forum for the examination of public and private responsibilities for natural resources and the environment, and a link between the specialized knowledge of academia and the information needs of government and industry. Course work is offered in both intensive (one to three weeks) and semester-long formats. For further information,

write to Dr. William F. Hyde, Director of Graduate Studies, Center for Resource and Environmental Policy Research, 102 Biological Sciences Building, Duke University, Durham, North Carolina 27706.

The University Program in Toxicology. This interdepartmental program provides graduate students and postdoctoral fellows an opportunity for a strong education in toxicology through support of courses, seminars, and research. The objectives of program members are to understand and devise controls for those toxicological phenomena having direct pertinence to human life and health, to train scholars who will advance the science of this discipline, and to provide a forum for faculty and student discussion of recent research developments. Students may base their training in general

toxicology, ecotoxicology, or in any area in which the faculty is currently involved. Prospective graduate students may apply to the program directly or to one of the participating departments, and must be admitted to the department and to the program. Information on fellowship support and application procedures may be obtained from Dr. William S. Lynn, Director, University Program in Toxicology, Box 3711, Duke University Medical Center, Durham, North Carolina 27710.

Organization for Tropical Studies. Duke University is a member of an international consortium created to promote an understanding of tropical environments through research and research-training programs in the tropics. A basic eight-week OTS course in tropical biology is conducted twice a year, and ad-



vanced course offerings are periodically scheduled in agriculture, anthropology, botany, earth sciences, forestry, geography, marine biology, meteorology, and zoology. For information, contact Dr. Donald Stone or Dr. Richard White, Department of Botany; or Dr. Kenneth Glanzer, Department of Anthropology; Duke University, Durham, North Carolina 27706.

General Regulations Governing Graduate Studies

The official, detailed *Bulletin of Duke University: Graduate School*, published in March of each year, gives an account of regulations concerning graduate work at Duke University and a full description of course content. The following pages are a summary of these materials for 1983-84 and should provide sufficient information for the prospective student. The bulletin is normally mailed to each student who is admitted to the Graduate School in the late spring of the year of matriculation so that the course program may be planned for the first year.

Admission

Admission is required of (1) all students who intend to pursue study toward a degree offered by the Graduate School, (2) all other students who desire credit for whatever purpose for graduate courses—except students who register as special students in the summer session or students who register for graduate courses through the Office of Continuing Education.

Many graduate departments will consider applications from students wishing to pursue degree study on a full-time or part-time basis. Admission requirements, procedures, and deadlines are the same for both full- and part-time students. The Graduate School does not specify a minimum course load requirement per semester, although students must maintain continuous registration from entry into Graduate School to completion of degree. The master's degree can be obtained on a totally part-time basis; the Ph.D. degree does require a mini-

mum of one year of full-time residence. Time limits for completion of degrees are the same for both full- and part-time students. Financial aid through Duke University is not available to part-time students (except during their year of full-time residence). Visa restrictions do not allow nonimmigrant students to pursue graduate study on a part-time basis.

A student seeking admission to the Graduate School of Duke University must have received the bachelor's degree (or the equivalent) from an accredited institution. The student's undergraduate program should be well-rounded and of high quality, indicating ability for graduate study. Ordinarily the student should have majored in the area of intended graduate study. Many departments (see the chapter "Advanced Degree Programs") list specific prerequisites. Satisfactory scores on the Graduate Record Examination are required by all departments. Students are urged to anticipate the language requirement and are reminded that the Graduate School Foreign Language Tests in French, German, Russian, and Spanish are offered to undergraduate and graduate students at many testing centers (see the section on language requirements in this chapter).

Procedures. A student seeking admission to the Graduate School should request the Dean of the Graduate School to send an application packet which contains all required forms and detailed application instructions. The application form should be filled out completely, signed, and returned to the Graduate Admissions Office accompanied by a non-refundable fee of U.S. \$35 in check or money order payable to Duke University. In addition, the student is required to provide the following supporting documents: (1) two copies of the official transcript from each post-secondary institution attended (college, university, or seminary) sent directly to the Graduate School by the institution; (2) as soon as possible, two supplementary transcripts showing completion of work which was in progress when the earlier transcript was made; (3) three letters of recommendation from

persons best qualified to judge the applicant as a prospective graduate student, written on the forms provided and returned by the applicant in the confidential envelopes that have been sealed-then-signed by the recommenders (recommenders may also return forms directly to the Graduate School); (4) official scores on the Graduate Record Examinations General (Aptitude) Test for all departments; and (5) official scores on the Graduate Record Examinations Subject (Advanced) Test for the Departments of Botany, English, Music, Physics, Romance Languages, and Zoology. It is recommended that the student take the Advanced Test if he or she is applying in anatomy, biochemistry, chemistry, electrical engineering, geology, mathematics, mechanical engineering and materials science, microbiology and immunology, pathology, pharmacology, philosophy, physiology, political science, or psychology.

Students applying for fall admission and award should take the Graduate Record Examination no later than the October testing in the previous year to meet our February 1 deadline. Further information on the GRE and registration forms can be provided at the applicant's college or by the Educational Testing Service, Box 955, Princeton, New Jersey 08541.

Fully qualified students from outside the United States are invited to apply for admission to a degree program. The foreign student must, in addition to the information required of all students, submit the following materials: (1) if the student's native language is not English, certification of English proficiency demonstrated by scores from the Test of English as a Foreign Language (TOEFL), administered through the Educational Testing Service, Box 899, Princeton, New Jersey 08541 (the Graduate School requires a score of 550 or higher on the TOEFL), and (2) a statement showing financial arrangements for the proposed term at Duke (estimated costs per calendar year are between \$16,000 and \$17,000). Foreign students may apply for full-time study only.

During new matriculants' first registration period at Duke, every foreign student whose native language is not English will be required to take an oral and written test to verify language facility. Until competence is determined, admission and arrangements for an award involving teaching must remain provisional. Students found to lack the necessary competence will be required to undertake additional English language instruction.

A student who does not successfully pass this course during the first year of residency will not be permitted to continue graduate work at Duke University. Passing this examination will not meet degree requirements for a foreign language.

Applicants who are admitted will be offered full admission, provisional admission, or nondegree admission and will receive a letter of admission from the Dean of the Graduate School and an acceptance form. Admission to the Graduate School is offered only by the Dean. The process of admission is not complete until the student returns the acceptance form. An admission offer is only for the semester specified in the letter of admission, and admission may not be deferred automatically from one term to another. *Provisional admission* for a trial period of one semester or a minimum of twelve hours of course work is offered to students who appear to warrant admission but do not fully comply with admission requirements. Graduate credit earned under provisional status may be applied toward an advanced degree at Duke University if and when the student is granted full admission. *Nondegree admission* is offered to students who meet the admission requirements and who desire to engage in graduate study not subject to the restrictions of a graduate degree program. With the approval of the student's major department and the Dean of the Graduate School, a maximum credit of 12 units earned under nondegree status may be applied toward an advanced degree at Duke University if and when the student is granted full admission.

It is the applicant's responsibility to make certain that the Graduate School office has received all required material before the specified deadlines. To ensure that the Admissions Office will have adequate time to assemble all items submitted on an applicant's behalf, applications should be submitted at least two weeks before the closing dates listed in the calendar at the close of this chapter. Materials submitted in support of an application are not released for other purposes and cannot be returned to the applicant.

We encourage all candidates to complete their applications by February 1 (for the program in clinical psychology, January 15). Anyone whose folder is not complete by that date will face the possibility that departmental enrollment will have been filled.

Earning the Degrees

Duke University offers graduate programs leading to the specified advanced degrees in the following fields:*

Anatomy, Ph.D.
 Anthropology, Ph.D.
 Art History, A.M.
 Biochemistry, Ph.D.
 Biomedical Engineering, M.S., Ph.D.
 Botany, A.M., M.S., Ph.D.
 Business Administration, Ph.D.
 Chemistry, M.S., Ph.D.
 Civil and Environmental Engineering, M.S., Ph.D.
 Classical Studies, Ph.D.
 Computer Science, A.M., Ph.D.
 Economics, A.M., Ph.D.
 Electrical Engineering, M.S., Ph.D.
 English, A.M., Ph.D.
 Forestry and Environmental Studies, A.M., M.S., Ph.D.
 Geology, M.S., Ph.D.
 Germanic Languages and Literature, A.M.
 Health Administration, M.H.A.

History, A.M., Ph.D.
 Humanities, A.M.
 Literature, Ph.D.
 Mathematics, A.M., M.S., Ph.D.
 Mechanical Engineering and Materials Science, M.S., Ph.D.
 Microbiology and Immunology, Ph.D.
 Music, A.M., Ph.D.
 Pathology, M.S., Ph.D.
 Pharmacology, Ph.D.
 Philosophy, A.M., Ph.D.
 Physical Therapy, M.S.
 Physics, A.M., Ph.D.
 Physiology, Ph.D.
 Political Science, A.M., Ph.D.
 Psychology, Ph.D.
 Public Policy Studies, A.M.
 Religion, A.M., Ph.D.
 Romance Languages, A.M., Ph.D.
 Sociology, A.M., Ph.D.
 Zoology, Ph.D.

The Language Requirement

Although individual departments establish their own minimal requirements (see individual departmental headnotes in the chapter "Advanced Degree Programs"), the regulations of the Graduate School require no foreign language for the master's degree, and, in many departments, a reading knowledge of one foreign language, ancient or modern, for the Ph.D. degree. The languages normally required are French, German, and Russian, but others may be offered if appropriate and approved. The foreign language requirement may be satisfied in the following ways: (1) by a passing score on one of the Graduate School Foreign Language Test (GSFLT) examinations administered at any national center prior to entering Duke or at Duke University after matriculation and taken no longer than six years before the preliminary examination, (2) by transfer from another institution, with the limitations set forth in the more detailed *Bulletin of Duke University: Graduate School*, (3) in any language for which GSFLT tests are not available, by a reading examination administered by a qualified examiner and arranged by the Graduate School office, or (4) by a reading

*Students interested in additional information on departmental programs not furnished in the *Bulletin of Duke University: Graduate School* should contact the Director of Graduate Studies in the appropriate department.



examination in any foreign language, administered by a qualified member of the faculty under a procedure specified by the department and approved by the Dean and the Executive Committee of the Graduate Faculty.

Advanced level, noncredit, reading courses in French and German are provided for students who need them.

In special circumstances a department that wishes to do so may ask the Dean and the Executive Committee of the Graduate Faculty to waive the language requirement.

Other Requirements

The general requirement for a master's degree is a minimum of 30 units (semester hours) of course-seminar-research credit. The student must present accept-

able grades for a minimum of 24 units of graduate courses. The nature of the additional 6 units for which students must register depends on whether they are enrolled in thesis or nonthesis programs; i.e., these last 6 units are earned either with successful submission of the thesis or with such other courses or academic exercises as are approved by the students' departments.

A master's program can be completed in one academic year, but the student who presents a thesis usually needs at least a calendar year, and foreign students should be prepared to study for two years. The maximum length of time permitted from first registration to completion of all requirements is six years. Under certain circumstances a maximum credit of 6 units may be transferred toward the

master's degree for graduate courses completed elsewhere, provided the grades earned in the particular courses were not less than *B* or the equivalent. In such a case, however, the transfer of graduate credit does not reduce the required minimum registration for a master's degree at Duke.

The course-seminar-research requirement in the doctoral program is a minimum of 60 units, but the proportions of course-seminar work and research are generally flexible, based on individual needs. Those applicants with master's degrees, after establishing quality work here, may be granted transfer credit up to a maximum of 30 units, i.e., the equivalent of one year of residence. The dissertation is expected to be a mature and competent piece of writing, embodying the results of original and significant research. All dissertations will be published on microfilm and the author may retain copyright privileges.

Time limitations are set for the completion of the doctoral program. The preliminary examination, which may be taken only after language, course-seminar, and residence requirements have been met, formally admits a student to candidacy for the degree. This examination should be passed by the end of the third year of doctoral study. The interval between preliminary examination and presentation of an acceptable dissertation should ordinarily be one to two years and may not be more than four years without special approval by the Dean. Should this interval extend beyond five years, a second preliminary examination usually becomes necessary.

Financial Information*

Tuition and fees are charged at the rate of \$226 per unit (a unit is equivalent to a semester hour), with the normal full program of study being 30 units for an academic year. Upon successful completion of the preliminary examination and the residence requirement, the normal full program during the dissertation period is

3 units per semester while in residence, or 1 unit per semester while not in residence. The basic necessary expenses for a year of graduate study, assuming one lives in University graduate housing, are therefore approximately as follows:

	<i>First and Second Year</i>	<i>Dissertation Year</i>
Tuition	\$6,780	\$1,356
Health Fee	184	184
Room Rent† (Central Campus Apartments)	2,850	2,850
Meals‡	1,670	1,670

†Depending upon accommodations chosen.

‡Cafeteria estimate.

Additional allowances should be made for books, laundry, and other personal expenditures.

Apartment accommodations for graduate and professional students are available in the Central Campus Apartments, the Town House Apartments, and modular homes, all of which are conveniently located close to East and West Campus. Two- and three-bedroom apartments are available furnished or unfurnished. It is expected that many more applications will be received for these units than can be accommodated. In addition to University housing, the Central Campus office maintains an off-campus listing service which provides a list of privately owned homes, apartments, duplexes, and efficiencies for rent in Durham.

Duke University does not have a deferred payment plan for tuition, fees, and other charges. Students are expected to pay tuition and fees at the time of matriculation unless they plan to pay via payroll deduction from payments received for fellowships, assistantships, or employment. Graduate students who receive payments from the University and who plan to pay tuition and fees and/or campus housing charges via payroll deduction must make arrangements in the Bursar's office for payroll deduction.

Financial Aid. In recent years at Duke about two-thirds of all full-time students

*The figures contained in this section are subject to change prior to the beginning of the fall, 1983, semester.

have held an award of some type; about one-third of these were aided by Duke funds and the other two-thirds by funds from other sources. Part-time students are not eligible for financial aid from the University.

The student who seeks financial aid from Duke University should be certain that the request for admission and award is filed not later than February 1 of the year in which September admission is sought. (The deadline is January 15 for the program in clinical psychology.) The application for admission, including transcripts of previous college work and letters of recommendation, is processed by the Graduate School and forwarded to the department in which the student wishes to pursue advanced work. The graduate faculty—or admissions committee—in the

department reviews all applications and then makes its recommendation to the Dean for announcement in late March. The most outstanding applicants are then offered awards; the next in order of rank are placed on an alternate list for awards. Other students are offered only admission to the Graduate School. Because of multiple applications by students, a fraction of the awards offered by any graduate school are not accepted. Alternates on the award list are immediately notified, and the process continues until the available number of awards has been made.

Awards to entering students at Duke are in the form of fellowships, scholarships, and assistantships. Students holding awards usually are paid in nine equal installments beginning in late September.



James B. Duke Graduate Fellowships are provided through a special endowment of the Duke Endowment. Fellows are chosen from nominations made by the departments. Only outstanding applicants who are seeking the Ph.D. degree are considered. These nominations are made in late February and are judged in a competition which includes candidates from all departments granting the Ph.D. degree. The fellowships provide for payment of tuition for full registration and a stipend of \$600 per month for twelve months during the duration of the award. The award requires no service beyond that which is required of all students in a given department as a part of their training and is renewable each year upon satisfactory progress toward the degree at a fellowship level of quality. The total value of a James B. Duke Fellowship over the full three years of tenure is over \$40,000 at current tuition rates.

Graduate Fellowships range in value to \$11,000 for the calendar year and are made on a year-to-year basis. They are awarded upon recommendation by each department. No service is required as a prerequisite for accepting a fellowship, but all fellowship holders are expected to maintain full-time registration.

Special Graduate Fellowships for Minority Students provide for payment of tuition plus a stipend of \$425 per month for nine months. They are awarded for one year to qualified applicants upon the recommendation of the department.

Graduate Scholarships provide for payment of tuition or partial tuition. Full tuition scholarships are valued at \$6,780 for the academic year. Scholarships are awarded upon the recommendation of each department.

Graduate Assistantships range in value to \$12,000 for the academic year. Assistants may be permitted to reduce their registration to 12 or 9 units, depending on the amount of service required. Residence credit as a full-time student is allowed under these circumstances. Assistantships are most common in the

science departments, where the student often provides laboratory assistance to various members of the faculty. Most graduate assistants remain in residence during the summer sessions carrying research or course credit. In this way, the normal progress toward a degree is not impeded by the reduced load during the fall and spring semesters. Departmental research funds are often available to provide financial assistance during the summer.

Other graduate fellowships are available from foundations, industry, or the government. Among those at the University's disposal are: Kearns fellowships in religion, Mellon fellowships and traineeships under a grant from the Office of Education for students in the Canadian Studies Program, and Medieval and Renaissance Studies fellowships. Over 300 other traineeships and assistantships are available in the biological, physical, and social sciences under grants from the National Institutes of Health, National Institutes of Mental Health, National Science Foundation, research agencies in the Department of Defense, and other governmental agencies.

Loans. Students who anticipate the need to supplement their financial resources through loans should contact their state lending agencies. These agencies provide loans through the Federally Insured Student Loan Program. Some have application deadlines as early as April 1. A list of the state lending agencies with addresses is available upon inquiry to the Graduate School office.

It is the policy of the Graduate School to provide loans through the University to help students meet their educational expenses. Only students with full-time status who meet the federal criteria for need but who are unable to obtain loans from their state agencies are eligible for loans through the University. Loan funds are provided through the Federally Insured Student Loan Program, the National Direct Student Loan Program, and funds solely under institutional control. Generally, loans made from these funds or the state lending agencies bear no in-

terest charge to qualified borrowers while they maintain student status and for a short period thereafter. Interest during the repayment period is at a generally favorable rate. The amount of a loan through Duke for first year graduate students is usually limited to the amount of tuition.

Inquiries concerning loans should indicate the department of intended matriculation and include all pertinent information concerning application to a state agency. These inquiries should be addressed to the Financial Aid Coordinator, Graduate School, Duke University, Durham, North Carolina 27706.

The costs of graduate education are high, but Duke University attempts to allocate its funds so that the superior student is able to finish work for a degree in the normal length of time regardless of personal financial resources. This is a contribution to the community of scholarship which the University is glad to bear.

The applicant who wishes further information on facilities and regulations on course programs not covered in this bulletin is invited to write to the Dean of the Graduate School, or the Director of Graduate Studies in the department of intended study.



Calendar of the Graduate School

Summer Session 1983

First Term: May 12-June 25
Second Term: June 28-August 11

Academic Year 1983-84

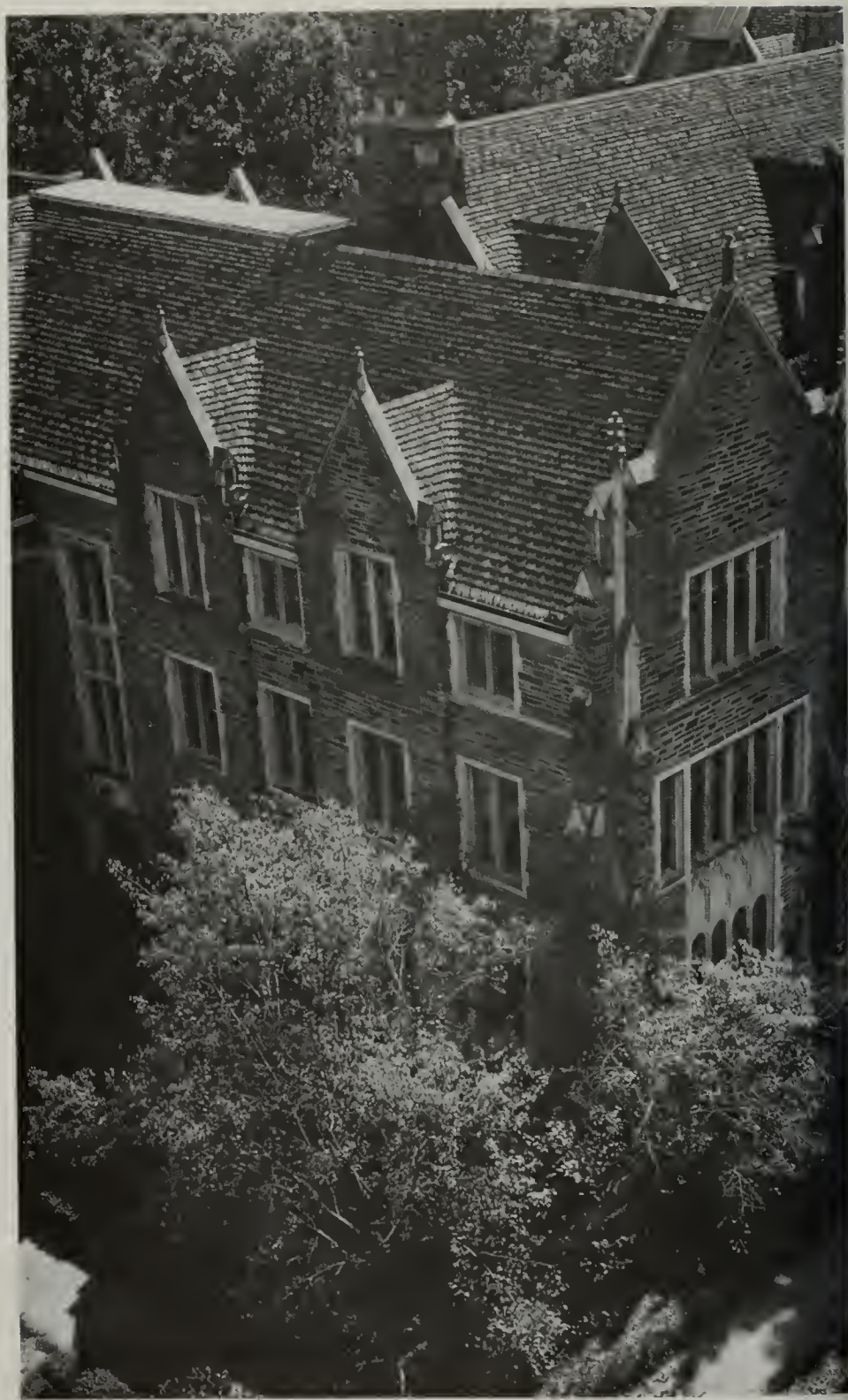
First Semester: August 30-December 19
Second Semester: January 9-April 30

August 23-24	Registration for first semester
August 30	Classes begin
October 15-18	Fall break
November 23-27	Thanksgiving recess
December 6-12	Reading period*
December 19	End of first semester
January 6	Registration for second semester
January 9	Classes begin
March 3-11	Spring recess
April 17-23	Reading period*
April 30	End of second semester
May 5-6	Commencement

Special Deadlines for Admission Applications

July 15, 1983	Last day for completing application for admission to the fall 1983 semester
November 1, 1983	Last day for completing application for admission to the spring 1984 semester
January 15, 1984	Final deadline for application to program in <i>clinical psychology</i> , fall 1984
February 1, 1984	Last day for completing application for admission and award to the fall 1984 semester †
April 15, 1984	Last day for completing application for admission to the first 1984 summer session ‡
May 15, 1984	Last day for completing application for admission to the second 1984 summer session ‡
July 15, 1984	Last day for completing application for admission to the fall 1984 semester

*For 200-level courses, the length of the reading period is at the discretion of the instructor.
†Applications completed after this date may be considered for admission, if all spaces have not been filled, and for financial aid, if funds are still available.
‡Students seeking admission to the Graduate School for study in the summer session should apply to the Dean of the Graduate School and to the Director of the Summer Session.



Advanced Degree Programs

Anatomy

Professor J. David Robertson, M.D. (Harvard), Ph.D. (Massachusetts Inst. of Tech.), *James B. Duke Professor of Anatomy and Chairman*

Professor Sheila J. Counce, Ph.D. (Univ. of Edinburgh), *Director of Graduate Studies*

Professors

Matt Cartmill, Ph.D. (Chicago); Harold Erickson, Ph.D. (Johns Hopkins); William C. Hall, Ph.D. (Duke); William Hylander, Ph.D. (Chicago); Montrose J. Moses, Ph.D. (Columbia), *R. J. Reynolds Industries Professor in Medical Education in the Department of Anatomy*; R. Bruce Nicklas, Ph.D. (Columbia); Elwyn L. Simons, Ph.D. (Princeton), D.Phil. (University Coll., Oxford)

Associate Professors

Joseph M. Corless, M.D., Ph.D. (Duke); Eric L. Effmann, M.D. (Indiana Univ. School of Med.); Richard F. Kay, Ph.D. (Yale); William Longley, Ph.D. (London); Thomas J. McIntosh, Ph.D. (Carnegie-Mellon); Michael K. Reedy, M.D. (Washington)

Assistant Professors

Nell Cant, Ph.D. (Michigan); Martin Joseph Costello III, Ph.D. (Duke); William E. Garrett, M.D., Ph.D. (Duke); Emma Raff Jakoi, Ph.D. (Duke); Michael K. Lamvik, Ph.D. (Chicago); Chia-Sheng Lin, Ph.D. (Vanderbilt); Ross D. E. MacPhee, Ph.D. (Alberta); Richard B. Marchase, Ph.D. (Johns Hopkins); Frederick H. Schachat, Ph.D. (Stanford); Kathleen P. Smith, Ph.D. (Harvard); Lee Tyrey, Ph.D. (Illinois)

Professor Emeritus

John Wendell Everett, Ph.D. (Yale)

Associate Professor Emeritus

Kenneth Lindsay Duke, Ph.D. (Duke)

Assistant Medical Research Professors

Hie Ping Beall, Ph.D. (Tulane); David Aaron Kopf, Ph.D. (Chicago); Alan David Magid, Ph.D. (Washington); Darrell R. McCaslin, Ph.D. (Duke); Kenneth A. Taylor, Ph.D. (California at Berkeley)

Lecturer

Irving T. Diamond, Ph.D. (Chicago)

The Department of Anatomy offers graduate programs designed to produce teachers and research workers competent in a broad range of anatomical sciences; the Ph.D. degree is offered. Students with a wide variety of backgrounds and interests in the biological sciences can be accommodated. All students participate in a core of

anatomical science courses (Anatomy 305, 307, 309) and gain experience in teaching over the range of departmental interests. Students are encouraged to round out their formal course work by drawing upon the offerings of other departments in the University, as well as those in the anatomy department. Laboratories within the department are equipped for and actively support research in several areas. For further information contact the Director of Graduate Studies.

Courses of Instruction

- | | |
|--|--|
| <p>216S. Biological Psychology
 217. Structure and Function of Visual Photoreceptors
 219. Molecular and Cellular Bases of Differentiation
 219S. Seminar
 220. Developmental Biology
 246. The Primate Fossil Record
 259. Molecular Biology I: Protein and Membrane Structure/Function
 260S. Interactions of Differentiated Cells
 269. Advanced Cell Biology
 270. Neurobiology I
 286. Electron Microscopy and Related Techniques
 301. Anatomy of the Limbs
 302. Advanced Topics and Research Seminar in Smooth and Striated Muscle</p> | <p>305. Gross Human Anatomy
 307. Microscopic Anatomy
 309. Neuroanatomy
 310. Frontiers in Neurobiology
 311. Concepts in Cell Biology
 312. Research
 313, 314. Anatomy Seminar
 340. Tutorial in Advanced Anatomy
 354. Research Techniques in Anatomy
 418. Reproductive Biology
 424. Seminar in Reproductive Biology</p> |
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Courses Currently Unscheduled

238. Functional and Evolutionary Morphology of Primates
 288S. The Cell in Development and Heredity

Anthropology

Professor William M. O'Barr, Ph.D. (Northwestern), *Chairman*
 Associate Professor Carol A. Smith, Ph.D. (Stanford), *Director of Graduate Studies*

Professors

Richard G. Fox, Ph.D. (Michigan); Ernestine Friedl, Ph.D. (Columbia), *James B. Duke Professor of Anthropology*; Elwyn L. Simons, Ph.D. (Princeton), D.Phil. (University Coll., Oxford)

Associate Professors

Mahadev L. Apte, Ph.D. (Wisconsin); Matt Cartmill, Ph.D. (Chicago); Kenneth E. Glander, Ph.D. (Chicago); William Hylander, Ph.D. (Chicago); Naomi R. Quinn, Ph.D. (Stanford)

Assistant Professors

Virginia R. Domínguez, Ph.D. (Yale); Atwood D. Gaines, M.P.H., Ph.D. (California at Berkeley); Robert P. Weller, Ph.D. (Johns Hopkins); Allen Zagarell, Ph.D. (Freie Univ., West Berlin)

Professor Emeritus

Weston LaBarre, Ph.D. (Yale), *James B. Duke Professor Emeritus of Anthropology*

Adjunct Associate Professors

Richard F. Kay, Ph.D. (Yale); Carol Stack, Ph.D. (Illinois)

The department offers graduate work leading to the Ph.D. degree in anthropology. Admission to the program is not contingent on previous anthropological course work or any other specific program of study at the undergraduate level.

The department offers a program of specialization in social/cultural anthropology and a program of specialization in physical anthropology. The emphasis of the social/cultural anthropology program is the application of a theoretical and comparative perspective to research in complex societies. Within this perspective, a wide range of interests is represented in the department. The emphasis of the physical anthropology program is primate evolution; areas of concentration include comparative morphology of human and nonhuman primates and primate social behavior.

Curriculum is tailored to the individual student's background, academic needs, and research goals; pursuit of relevant cross-disciplinary study, within and outside the department, is expected. However, a modest number of courses is required of students in both programs. Candidates for the Ph.D. degree must demonstrate competence in their chosen subfield of specialization and knowledge of the broad theoretical perspectives, from all relevant disciplines, which inform their area of concentration.

Further details of the graduate program in anthropology, the departmental facilities, the staff, and various stipends available are described in the *Guidelines for Graduate Students in Anthropology* which may be obtained from the Director of Graduate Studies.

Courses of Instruction

204S. The Anthropology of Cities
 205. The Anthropology of Anthropology
 206S. Current Theoretical Schools in Anthropology
 211S. Ethnography of Communication
 215S. Gender Roles in Cross-Cultural Perspective
 228S. Slavery and Society
 234S. Political Economy of Development: Theories of Change in the Third World
 237S. Interpretations of Kinship
 239. Culture and Ideology
 241. The Rise of Civilization in Mesopotamia and Iran
 243S. Theory and Method in Archaeology
 244S. Primate Behavior
 246S. The Primate Fossil Record
 251. Ethnography of Humor

255. Ethnopsychiatry, Ethnomedicine, and Cross-Cultural Psychiatry
 258S. Symbols in Society
 267. Cognitive Anthropology
 275S. Inequality in Precapitalist Societies
 280S, 281S. Seminar in Selected Topics
 282S. Canada
 330S, 331S. Theories in Sociocultural Anthropology
 393. Individual Research in Anthropology

Courses Currently Unscheduled

256. Topics in Psychological Anthropology
 273S. Precapitalist Modes of Production and Exchange
 274S. Inequality in Peripheral Capitalist Societies
 334. Topics in Physical Anthropology

Art

Professor John R. Spencer, Ph.D. (Yale), *Director of Graduate Studies*

Associate Professor

Rona Goffen, Ph.D. (Columbia)

Assistant Professors

Caroline A. Bruzelius, Ph.D. (Yale); Ann Epstein, Ph.D. (Univ. of London); Elizabeth G. Higdon, Ph.D. (Bryn Mawr); Duncan T. Kinkead, Ph.D. (Michigan); Michael E. Shapiro, Ph.D. (Harvard)

Professor Emeritus

Sidney David Markman, Ph.D. (Columbia)

Graduate work in the Department of Art is offered leading to the A.M. degree in art history and is designed to provide basic training in the history of art with specialization in a given field selected by the student after consultation with and approval of the Director of Graduate Studies. Prospective students should present a minimum of 24 semester hours of undergraduate work in the history of art. In special cases a student who does not fulfill this prerequisite may be required to attend prescribed undergraduate courses. A reading knowledge of one foreign language (preferably German) is required; candidates who do not meet this requirement upon admission to the program are expected to do so by the end of their first term in residence.

The program for the A.M. degree in art history consists of 30 units as follows: 12 units in art history; 6 units in an approved minor; 6 units in the major or minor, or other approved subject; and 6 units in thesis. A written thesis is required. Candidates must also pass written comprehensive examinations testing their knowledge of art history and pertinent bibliographical resources.

Courses of Instruction

220S. Greek Painting
230S. Medieval and Byzantine Art and Architecture
232S. Romanesque and Gothic Art and Architecture
240. Italian Art
242S. Studies in Italian Renaissance Art
262S. Problems in Nineteenth-Century Art
257S. Problems in Modern Art
277S. Contemporary Art

279S. Problems in Modern Architecture
293S. Methods in Art History
294, 295. Special Problems in Art History

Courses Currently Unscheduled

253. Spanish Baroque Painting
281S. Problems in Pre-Columbian Art and Archaeology
282S. Problems in Latin-American Art

Asian Languages

The courses are offered as an enrichment for students interested in the South Asian subcontinent and may be taken as a general elective by advanced undergraduate students. No major work is offered in Hindi-Urdu.

Hindi-Urdu 200-201. Special Studies in South Asian Languages
Hindi-Urdu 203. Studies in Commonwealth Literature

For courses in Chinese and Japanese, see *Bulletin of Duke University: Undergraduate Instruction*.

Biochemistry

Professor Robert L. Hill, Ph.D. (Kansas), *James B. Duke Professor of Biochemistry and Chairman*
Associate Professor Lewis M. Siegel, Ph.D. (Johns Hopkins), *Director of Graduate Studies*

Professors

Irwin Fridovich, Ph.D. (Duke), *James B. Duke Professor of Biochemistry*; Samson R. Gross, Ph.D. (Columbia); Walter R. Guild, Ph.D. (Yale); Henry Kamin, Ph.D. (Duke); Norman Kirshner, Ph.D. (Pennsylvania State); Kenneth S. McCarty, Ph.D. (Columbia); K. V. Rajagopalan, Ph.D. (Univ. of Madras); Robert E. Webster, Ph.D. (Duke)

Associate Professors

Robert Bell, Ph.D. (California at Berkeley); Ronald C. Greene, Ph.D. (California Inst. of Tech.); Bernard Kaufman, Ph.D. (Indiana); William Sanford Lynn, Jr., M.D. (Columbia); Paul L. Modrich, Ph.D. (Stanford); David C. Richardson, Ph.D. (Massachusetts Inst. of Tech.); Harvey J. Sage, Ph.D. (Yale); James B. Sullivan, Ph.D. (Texas)

Assistant Professors

Arno L. Greenleaf, Ph.D. (Harvard); Robert L. Habig, Ph.D. (Purdue); Michael S. Hershfield, M.D. (Pennsylvania); Edward W. Holmes, M.D. (Pennsylvania); Tao-shih Hsieh, Ph.D. (California at Berkeley); Nicholas M. Kredich, M.D. (Michigan); Robert J. Lefkowitz, M.D. (Columbia); Patrick A. McKee, M.D. (Oklahoma); Salvatore V. Pizzo, M.D., Ph.D. (Duke); Allen D. Roses, M.D. (Pennsylvania); Deborah A. Steege, Ph.D. (Yale); Robert W. Wheat, Ph.D. (Washington Univ.)

Assistant Medical Research Professors

Celia Bonaventura, Ph.D. (Purdue); Joseph Bonaventura, Ph.D. (Texas)

Associates

John Bittikofer, Ph.D. (Purdue); Yasuhiko Nozaki, Ph.D. (Univ. of Tokyo)

Graduate work in the Department of Biochemistry is offered leading to the Ph.D. degree. Preparation for such graduate study may take diverse forms. Undergraduate majors in chemistry, biology, mathematics, or physics are welcome, but adequate preparation in chemistry is essential. Graduate specialization areas include protein

structure and function, crystallography of macromolecules, nucleic acid structure and function, lipid biochemistry, membrane structure and function, molecular genetics, enzyme mechanisms, and neurochemistry. The Division of Genetics of the department, in cooperation with the University Program in Genetics, offers biochemistry students the opportunity to pursue advanced research and study to fulfill the requirements for the Ph.D. degree.

Courses of Instruction

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|--|---|
| 200. General Biochemistry | 245L. Macromolecules, Ecology, and Evolution |
| 209-210. Independent Study | 259. Molecular Biology I: Protein and Membrane Structure/Function |
| 215. Genetic Mechanisms | 265S, 266S. Seminar |
| 219. Molecular and Cellular Bases of Differentiation | 268. Molecular Biology II: Nucleic Acids |
| 219S. Seminar | 276. Comparative and Evolutionary Biochemistry |
| 220L. Adaptations of Organisms to the Marine Environment | 286. Current Topics in Immunochemistry |
| 220S. Adaptations of Organisms to the Marine Environment | 288. The Carbohydrates and Lipids of Biological Systems |
| 222. Structure of Biological Macromolecules | 291. Physical Biochemistry |
| 224. Biochemistry of Development and Differentiation | 296. Biological Oxidations |
| 227. Introductory Biochemistry I: Intermediary Metabolism | 297. Intermediary Metabolism |
| 228. Introductory Biochemistry II: Biological Macromolecules | 299. Nutrition |
| | 345, 346. Biochemistry Seminar |
| | 347, 348. Seminar in Toxicology |

Botany

Professor Richard A. White, Ph.D. (Michigan), *Chairman*

Associate Professor Richard B. Searles, Ph.D. (California at Berkeley), *Director of Graduate Studies*

Professors

Janis Antonovics, Ph.D. (Univ. Coll. of North Wales); Richard T. Barber, Ph.D. (Stanford); John E. Boynton, Ph.D. (California at Davis); William Lewis Culberson, Ph.D. (Wisconsin); Terry W. Johnson, Jr., Ph.D. (Michigan); Aubrey Willard Naylor, Ph.D. (Chicago), *James B. Duke Professor of Botany*; Jane Philpott, Ph.D. (Iowa); Donald E. Stone, Ph.D. (California at Berkeley); Boyd R. Strain, Ph.D. (California at Los Angeles); Robert L. Wilbur, Ph.D. (Michigan)

Associate Professors

Norman L. Christensen, Jr., Ph.D. (California at Santa Barbara); Kenneth R. Knoerr, Ph.D. (Yale); Joseph S. Ramus, Ph.D. (California at Berkeley); James N. Siedow, Ph.D. (Indiana)

Assistant Professor

William H. Schlesinger, Ph.D. (Cornell)

Professors Emeriti

Lewis Edward Anderson, Ph.D. (Pennsylvania); William D. Billings, Ph.D. (Duke), *James B. Duke Professor Emeritus of Botany*; Henry Hellmers, Ph.D. (California at Berkeley); Paul J. Kramer, Ph.D. (Ohio State), *James B. Duke Professor Emeritus of Botany*

Adjunct Professor

Chicita F. Culberson, Ph.D. (Duke)

Adjunct Assistant Professor

David T. Patterson, Ph.D. (Duke)

Graduate work in the Department of Botany is offered leading to the A.M. (non-thesis), M.S. (thesis), and Ph.D. degrees. Before undertaking graduate study in botany a student should have had in the undergraduate program at least 12 semester hours of botany beyond an elementary course, and related work in biological sciences. Some work in chemistry and physics will be desirable and, for some phases of botan-

ical study, a necessity. The student's graduate program is planned to provide a broad basic training in the various fields of botany, plus intensive specialization in the field of the research problem.

Courses of Instruction

- 209L. Lichenology
- 212L. Phycology
- 215L. Primary Productivity in the Seas
- 218. Barrier Island Ecology
- 219L. Benthic Marine Algae
- 221L. Mycology
- 225T, 226T. Special Problems
- 227. Introductory Biochemistry I: Intermediary Metabolism
- 228. Introductory Biochemistry II: Biological Macromolecules
- 232. Microclimatology
- 237L. Systematic Biology
- 242L. Systematics
- 243S. Classification of Angiosperms
- 244L. Diversity of Plants
- 245L. Plant Diversity
- 246L. Ecology of Plants
- 247L. Plant Ecology
- 250L,S. Plant Biosystematics
- 251L. Plant Physiology
- 253. Biophysical Plant Physiology
- 258. Physiology of Growth and Development
- 260L. Plant Anatomy
- 261. Photosynthesis
- 263L. Tropical Seaweeds
- 265. Physiological Plant Ecology
- 265L. Physiological Plant Ecology
- 267L. Plant Community Ecology
- 268. Molecular Biology II: Nucleic Acids
- 269. Advanced Cell Biology
- 272. Ecosystem Analysis
- 280. Principles of Genetics
- 283. Extrachromosomal Inheritance
- 285S. Ecological Genetics
- 286. Evolutionary Mechanisms
- 293L. Population Biology
- 295S, 296S. Seminar
- 300. Tropical Biology: An Ecological Approach
- 330L. Environmental Monitoring and Instrumentation
- 359, 360. Research in Botany

Courses Currently Unscheduled

- 204L. Marine Microbiology
- 210L. Bryology
- 344. Micrometeorology and Biometeorology Seminar

Business Administration

Professor Thomas F. Keller, Ph.D. (Michigan), *R. J. Reynolds Industries Professor of Business Administration and Dean*

Associate Professor John W. Payne, Ph.D. (California at Irvine), *Director of Graduate Studies*

Professors

Helmy Baligh, Ph.D. (California at Berkeley); James R. Bettman, Ph.D. (Yale), *IBM Research Professor, Fuqua School of Business*; Colin C. Blaydon, Ph.D. (Harvard); Kalman J. Cohen, Ph.D. (Carnegie-Mellon); John D. Forsyth, D.B.A. (Illinois); Dan J. Laughhunn, D.B.A. (Illinois); Arie Y. Lewin, Ph.D. (Carnegie-Mellon); Richard C. Morey, Ph.D. (California at Berkeley); David W. Peterson, Ph.D. (Stanford); Richard Staelin, Ph.D. (Michigan), *T. Austin Finch Professor of Business Administration*; James H. Vander Weide, Ph.D. (Northwestern); W. Kip Viscusi, Ph.D. (Harvard)

Associate Professors

Joseph Battle, Ph.D. (Michigan); Richard M. Burton, D.B.A. (Illinois); Robert Capettini, Ph.D. (Illinois at Urbana-Champaign); David C. Dellinger, Ph.D. (Stanford); David A. Dittman, Ph.D. (Ohio State); Joel C. Huber, Ph.D. (Pennsylvania); John S. Hughes, Ph.D. (Purdue); Roy J. Lewicki, Ph.D. (Columbia); John M. McCann, Ph.D. (Purdue); Wesley A. Magat, Ph.D. (Northwestern); Steven F. Maier, Ph.D. (Stanford); Richard J. Rendleman, Jr., Ph.D. (North Carolina at Chapel Hill); Roger W. Schmenner, Ph.D. (Yale); James W. Vaupel, Ph.D. (Harvard)

Assistant Professors

Marian Burke, Ph.D. (California at Los Angeles); Robert M. Conroy, D.B.A. (Indiana); Ellen F. Cox, Ph.D. (California at Berkeley); Julie A. Edell, Ph.D. (Carnegie-Mellon); Grant W. Gardner, Ph.D. (Harvard); Christine R. Hekman, Ph.D. (Chicago); Kirk R. Karwan, Ph.D. (Carnegie-Mellon); William E. Ricks, Ph.D. (California at Berkeley); Herbert L. Schuette, Ph.D. (Michigan); Blair H. Sheppard, Ph.D. (Illinois at Champaign); Anne S. Tsui, Ph.D. (California at Los Angeles)

The Ph.D. in Business Administration program prepares candidates for research and teaching careers at leading educational institutions and for careers in business and governmental organizations where advanced research and analytical capabilities

are required. The Ph.D. program places major emphasis on independent inquiry, on the development of competence in research methodology, and on the communication of research results.

The program requires that doctoral candidates must acquire expertise in three disciplines: economics, behavioral science, and quantitative methods. In addition, each candidate must acquire knowledge at the M.B.A. level of at least three of the following functional areas: accounting, finance, marketing, and operations management. Competence in the three disciplines and the functional areas may be gained from the student's choice of course work, participation in seminars, and independent study. Each student takes a comprehensive exam at the end of the second year or the beginning of the third year of residence. The final requirement is the presentation of a dissertation. The Ph.D. program usually requires three to four years of work beyond the bachelor's degree. Students entering the program with an M.B.A. or other advanced work will usually be able to reduce the time in residence by a year.

Refer to the *Bulletin of Duke University: The Fuqua School of Business* for a complete list of courses and course descriptions.

Courses of Instruction

- 521. Organization Seminar: A Micro Focus
- 522. Organization Seminar: A Macro Focus
- 531. Financial Accounting Seminar
- 532. Management Accounting Seminar
- 551. Corporate Finance Seminar
- 552. Investment Seminar
- 561. Seminar in Quantitative Research in Marketing
- 562. Seminar in Behavioral Models in Marketing
- 571. Operations Strategy Seminar
- 572. Seminar in Operational and Technological Tactics

Courses Currently Unscheduled

- 309.1-.9. Research in Managerial Economics
- 319.1-.9. Research in Quantitative Methods
- 329.1-.9. Research in Organization Theory and Management
- 339.1-.9. Research in Information and Accounting Systems
- 349.1-.9. Research in Public Policy and Social Responsibility
- 359.1-.9. Research in Finance
- 369.1-.9. Research in Marketing
- 379.1-.9. Research in Production
- 392-393. Tutorial in Interdisciplinary Areas
- 397. Dissertation Research

The University Program in Cell and Molecular Biology

Professor Robert L. Hill, Ph.D. (Kansas), *James B. Duke Professor of Biochemistry and Director*
Associate Professor Bernard Kaufman, Ph.D. (Indiana), *Associate Director*

Professors

Peter K. Lauf, M.D. (Frieburg); R. Bruce Nicklas, Ph.D. (Columbia); Salvatore V. Pizzo, M.D., Ph.D. (Duke); Thomas C. Vanaman, Ph.D. (Duke)

Associate Professors

Paul L. Modrich, Ph.D. (Stanford); James N. Siedow, Ph.D. (Indiana)

Assistant Professors

P. Michael Conn, Ph.D. (Baylor); Richard B. Marchase, Ph.D. (Johns Hopkins)

Faculty: A complete list of faculty, including research interests, will be made available to prospective students.

Research training in cell, developmental, and molecular biology is found in eight departments at Duke University: anatomy, biochemistry, botany, microbiology and immunology, pathology, pharmacology, physiology, and zoology. To effectively utilize this broad spectrum of expertise for the training of promising young scientists while still providing a coherent curriculum, the Duke University Program in Cell and Molecular Biology has been established.

During the first year of doctoral study a student will complete the program's three-course sequence presenting current understanding and research activities in

cell biology and the molecular biology of nucleic acids, proteins, and membranes. Each student will also affiliate with a department, fulfill departmental requirements, and choose elective courses in an area of specialization. Research training is stressed throughout the program and dissertation research usually begins by the third semester. Normally the dissertation adviser will be chosen from within the student's own department but, depending on the student's research interests, dissertation research with an adviser in another department may be approved.

Prospective students may apply directly to the Cell and Molecular Biology Program or to one of the eight participating departments. Those who apply to the program must also designate a departmental preference. Applicants must have demonstrated, in addition to overall academic excellence, a proficiency in the biological and physical sciences. Applications for admission and fellowship support must be received by February 1, but early applications may receive earlier consideration.

Courses of Instruction

259. Molecular Biology I: Protein and Membrane
Structure/Function
264. Cell and Molecular Biology Seminar

268. Molecular Biology II: Nucleic Acids
269. Advanced Cell Biology

Chemistry

Professor Charles H. Lochmüller, Ph.D. (Fordham), *Chairman*

Professor Richard L. Wells, Ph.D. (Indiana), *Director of Graduate Studies*

Professors

Edward M. Arnett, Ph.D. (Pennsylvania), *R. J. Reynolds Industries Professor of Chemistry*; Donald B. Chesnut, Ph.D. (California Inst. of Tech.); Bertram O. Fraser-Reid, Ph.D. (Alberta); Peter W. Jeffs, Ph.D. (Univ. of Natal); William R. Krigbaum, Ph.D. (Illinois), *James B. Duke Professor of Chemistry*; Andrew T. McPhail, Ph.D. (Univ. of Glasgow); Richard A. Palmer, Ph.D. (Illinois); Jacques C. Poirier, Ph.D. (Chicago); Ned Allen Porter, Ph.D. (Harvard); Louis DuBose Quin, Ph.D. (North Carolina at Chapel Hill), *James B. Duke Professor of Chemistry*; Peter Smith, Ph.D. (Univ. of Cambridge); Howard Austin Strobel, Ph.D. (Brown); Pelham Wilder, Jr., Ph.D. (Harvard)

Associate Professors

Steven Baldwin, Ph.D. (California Inst. of Tech.); Alvin L. Crumbliss, Ph.D. (Northwestern); Robert W. Henkens, Ph.D. (Yale); Barbara R. Shaw, Ph.D. (Washington)

Assistant Professors

C. William Anderson, Ph.D. (Cincinnati); Daniel D. Sternbach, Ph.D. (Brandeis)

Adjunct Professors

Robert G. Ghirardelli, Ph.D. (California Inst. of Tech.); Colin G. Pitt, Ph.D. (Univ. of London); Bernard Spielvogel, Ph.D. (Michigan)

Adjunct Assistant Professors

Santosh K. Gangwal, Ph.D. (Univ. of Waterloo); Mary Ellen Switzer, Ph.D. (Illinois)

In the Department of Chemistry graduate work is offered leading to the M.S. and Ph.D. degrees. Before undertaking a graduate program in chemistry, a student should have taken an undergraduate major in chemistry, along with related work in mathematics and physics.

Graduate courses in the department are offered in the fields of analytical, inorganic, organic, and physical chemistry. Research programs are active in all these fields.

A booklet providing detailed information on the department is available from the Director of Graduate Studies.

Courses of Instruction

- | | |
|---|---|
| 201. Molecular Spectroscopy | 313. Special Topics in Inorganic Chemistry |
| 203. Quantum Chemistry | 320. Synthetic Organic Chemistry |
| 205. Structure and Reaction Dynamics | 322. Organic Reactive Intermediates |
| 207. Principles of Thermodynamics, Diffraction,
and Kinetics | 324. Special Topics in Organic Chemistry |
| 275, 276. Advanced Studies | 330. Separation Science and Fundamental
Electrochemistry |
| 300. Basic Statistical Mechanics | 331, 332. Special Topics in Analytical Chemistry |
| 302. Basic Quantum Mechanics | 334. Chemical Instrumentation and Practical
Electrochemistry |
| 303, 304. Special Topics in Physical Chemistry | 373, 374. Seminar |
| 310. Theoretical and Structural Inorganic
Chemistry | 375, 376. Research |
| 312. Inorganic Reactions and Mechanisms | 377. Research Orientation Seminar |

Classical Studies

Professor Francis Newton, Ph.D. (North Carolina at Chapel Hill), *Chairman*
Professor Lawrence Richardson, Jr., Ph.D. (Yale), *James B. Duke Professor of Latin in Classical Studies and
Director of Graduate Studies*

Professors

John F. Oates, Ph.D. (Yale); William H. Willis, Ph.D. (Yale)

Associate Professors

Peter Burian, Ph.D. (Princeton); Kent J. Rigsby, Society of Fellows (Harvard); Dennis Keith Stanley, Jr.,
Ph.D. (Johns Hopkins); John G. Younger, Ph.D. (Cincinnati)

Assistant Professor

Mary T. Boatwright, Ph.D. (Michigan)

The Department of Classical Studies offers two programs leading to the Ph.D. degree, one with emphasis on literature and philology, the other with emphasis on ancient history and archaeology. For regular admission to the program in literature and philology, a student must have three years of college study above the elementary level in one of the classical languages and two college years in the other. Students wishing to enter the program in ancient history and archaeology will be required on entrance to demonstrate satisfactory competence in both Greek and Latin for reading in the primary sources; failure to demonstrate such competence will require modification of the student's program to repair the deficiency.

The department's special requirements, in addition to the general requirements of the University for the Ph.D. degree set forth in the section on degree requirements of this bulletin and in the large *Bulletin of Duke University: Graduate School*, are presented in a sheet that may be obtained from the Director of Graduate Studies. They include special requirements in course work and the preliminary examination for the Ph.D. degree.

A reading knowledge of German and French is required of all candidates for the Ph.D. degree. The candidate should meet one of the language requirements by the end of the first term in residence and the other by the end of the third term.

Greek

Courses of Instruction

- | | |
|------------------------|------------------------------------|
| 200. Graduate Reading | 301. Greek Seminar I |
| 203. Homer | 304. Greek Seminar IV |
| 205. Greek Lyric Poets | 321. Seminar in Literary Papyri |
| 206. Aeschylus | 399. Directed Reading and Research |
| 210. Aristophanes | |
| 226. Orators | |

Courses Currently Unscheduled

- 209. Euripides
- 221. Early Greek Prose
- 222. Thucydides
- 231. Hellenistic Poetry
- 302. Greek Seminar II
- 303. Greek Seminar III
- 313. Proseminar in Greek Epigraphy

Latin

Courses of Instruction

- 200. Graduate Reading
- 203. Epic: Vergil
- 210. Lyric and Occasional Poetry
- 211. Elegiac Poets
- 221. Medieval Latin
- 301. Latin Seminar I
- 302. Latin Seminar II
- 303. Latin Seminar III
- 304. Latin Seminar IV
- 312. Proseminar in Latin Paleography
- 399. Directed Reading and Research

Courses Currently Unscheduled

- 201. The Verse Treatise
- 204. Epic
- 306. Latin Seminar VI
- 314. Proseminar in Latin Epigraphy
- 315. Proseminar in Roman Law

Classical Studies

Courses of Instruction

- 301. Introduction to Classical Philology I

Under the terms of a cooperative agreement, graduate students of Duke University may take any graduate course offered by the Department of Classics of the University of North Carolina. A list of these courses will be sent upon request.

Computer Science

Professor Thomas M. Gallie, Ph.D. (Rice), *Acting Chairman*

Professor Arnold L. Rosenberg, Ph.D. (Harvard), *Director of Graduate Studies*

Professors

Donald W. Loveland, Ph.D. (New York Univ.); Peter N. Marinos, Ph.D. (North Carolina State); Merrell L. Patrick, Ph.D. (Carnegie Inst. of Tech.); Charles Starmer, Ph.D. (North Carolina at Chapel Hill); Senol Utku, Sc.D. (Massachusetts Inst. of Tech.); Max A. Woodbury, Ph.D. (Michigan)

Associate Professors

Alan W. Biermann, Ph.D. (California at Berkeley); Kishor S. Trivedi, Ph.D. (Illinois); Robert A. Wagner, Ph.D. (Carnegie-Mellon)

Assistant Professors

Bruce W. Ballard, Ph.D. (Duke); Robert M. Geist III, Ph.D. (Notre Dame); Connie U. Smith, Ph.D. (Texas)

Associate Research Professors

J. Mailen Kootsey, Ph.D. (Brown); Dietolf Ramm, Ph.D. (Duke)

Assistant Research Professor

Keven W. Bowyer, Ph.D. (Duke)

Courses Currently Unscheduled

- 302. Introduction to Classical Philology II
- 351. The Teaching of Classics

Classical Studies (Ancient History)

Courses of Instruction

- 253. Greece to the Orientalizing Period
- 255. The Age of Pericles
- 261. The Roman Revolution, 146-30 B.C.
- 321. Seminar in Ancient History I
- 399. Directed Reading and Research

Courses Currently Unscheduled

- 258. Social and Cultural History of the Graeco-Roman World
- 322. Seminar in Ancient History II
- 323. Seminar in Ancient History III
- 324. Seminar in Ancient History IV
- 327. Seminar in Byzantine History

Classical Studies (Archaeology)

Courses of Instruction

- 232S. Greek Painting
- 233. Greek Architecture
- 234. Roman Sculpture
- 235S. Roman Architecture
- 236S. Roman Painting

Courses Currently Unscheduled

- 231S. Greek Sculpture
- 311. Archaeology Seminar I
- 312. Archaeology Seminar II

The Department of Computer Science offers programs leading to the A.M. and Ph.D. degrees. The Ph.D. program is a joint offering with the computer science department of the University of North Carolina at Chapel Hill.

A student entering graduate work in computer science should have a knowledge of mathematics through advanced calculus, of data structures, and of assembler as well as higher-level computer programming languages. Research interests of present faculty include mathematical foundations of computer science, artificial intelligence, analysis of algorithms, programming methodology, real-time computing, operating data base systems, computer systems design and analysis, parallel processing systems, numerical analysis, and very large-scale integration.

Courses of Instruction

- 200. Programming Methodology I
- 201. Programming Languages
- 202. Applied Discrete Structures
- 204. Computer Network Architecture
- 207. Fault-Tolerant Computer Systems
- 208. Digital Computer Design
- 209. Microprocessor Fundamentals and Applications
- 210. VLSI Systems: an Introduction
- 215. Artificial Intelligence
- 220. VLSI Algorithmics
- 221. Numerical Analysis I
- 222. Numerical Analysis II
- 224. Analysis of Algorithms
- 225. Formal Languages and Theory of Computation
- 226. Mathematical Methods for Systems Analysis I
- 227. Mathematical Methods for Systems Analysis II
- 231. Introduction to Operating Systems
- 232. Compiler Construction
- 241. Data Base Methodology
- 252. Computer Systems Organization
- 265. Advanced Topics in Computer Science

- 308. Advanced Topics in Digital Systems
- 310. CMOS VLSI Design
- 315. Advanced Artificial Intelligence
- 326. Systems Modeling
- 331. Operating Systems Theory

Courses Currently Unscheduled

- 301. Topics in Programming Theory
- 321. Topics in Numerical Mathematics
- 325. Theory of Computation
- 332. Topics in Operating Systems

Supplementary Courses Offered at UNC-CH

- Comp 114. Systematic Programming
- Comp 145. Software Engineering Laboratory
- Comp 171. Natural Language Processing
- Comp 230. File Management Systems
- Comp 236. Computer Graphics
- Comp 254. Picture Processing and Pattern Recognition
- Comp 265. Architecture of Computers

Economics

Professor Thomas D. Wallace, Ph.D. (Chicago), *James B. Duke Professor of Economics and Chairman*
 Professor Eliot Roy Weintraub, Ph.D. (Pennsylvania), *Director of Graduate Studies*

Professors

Martin Bronfenbrenner, Ph.D. (Chicago), *William R. Kenan, Jr. Professor of Economics*; David G. Davies, Ph.D. (California at Los Angeles); Craufurd D. Goodwin, Ph.D. (Duke), *James B. Duke Professor of Economics*; Henry Grabowski, Ph.D. (Princeton); Daniel A. Graham, Ph.D. (Duke); Thomas M. Havrilesky, Ph.D. (Illinois); Allen C. Kelley, Ph.D. (Stanford); Harold Gregg Lewis, Ph.D. (Chicago); Thomas H. Naylor, Ph.D. (Tulane); Edward Tower, Ph.D. (Harvard); Vladimir G. Trembl, Ph.D. (North Carolina at Chapel Hill); John M. Vernon, Ph.D. (Massachusetts Inst. of Tech.); William P. Yohe, Ph.D. (Michigan)

Associate Professors

Charles T. Clotfelter, Ph.D. (Harvard); Philip J. Cook, Ph.D. (California at Berkeley); Marjorie McElroy, Ph.D. (Northwestern)

Assistant Professors

Philip L. Brock, Ph.D. (Stanford); Cecilia A. Conrad, Ph.D. (Stanford); Robert Franklin Conrad, Ph.D. (Wisconsin); Kent P. Kimbrough, Ph.D. (Chicago); Michael I. Luger, Ph.D. (California at Berkeley); David Bruce Nickerson, Ph.D. (Northwestern); Dale O. Stahl II, Ph.D. (California at Berkeley); George E. Tauchen, Ph.D. (Minnesota); Gary A. Zarkin, Ph.D. (Chicago)

The Department of Economics offers graduate work leading to the A.M. and Ph.D. degrees. Among the undergraduate courses of distinct advantage to the graduate student in economics are statistics, economic theory, and basic courses in philosophy, mathematics, and social sciences other than economics. Advanced work in mathematics or statistics is also useful.

Requirements for the Ph.D. degree in economics include courses in economic theory, quantitative methods, and econometrics in the first year, and at the end of the second year, an examination in economic analysis. In addition, a student must obtain certification in three fields, one of which may be in an outside minor. The student may select from advanced economic theory, history of political economy, economic development, economic history, international economics, money and banking, labor economics, public finance, industrial organization, econometrics, statistics, Soviet economics, corporate economics, and certain fields outside the economics department (e.g., demography). Course work for the Ph.D. degree should be completed in five semesters of residence.

Courses of Instruction

- 200. Capitalism and Socialism
- 204S. Advanced Monetary Economics
- 205S. Advanced Monetary Theory and Policy
- 212S. Economic Science and Economic Policy
- 219. Economic Problems of Underdeveloped Areas
- 232S. Economic History of Japan
- 233. State and Urban Finance
- 234. Urban and Regional Economics
- 235. The Economics of Crime, Law Enforcement, and Justice
- 237. Statistical Methods
- 243. Econometrics I
- 244. Corporate Economics I
- 245. Econometrics II
- 246. Selected Topics in Econometric Theory
- 250. Modern Economic Thought
- 265S. International Trade and Finance
- 282S. Canada
- 285. Evaluation of Public Expenditures
- 287. Public Finance
- 293. Soviet Economic History
- 294S. Soviet Economic System
- 301. Microeconomic Analysis I
- 302. Microeconomic Analysis II
- 304, 305. Monetary Theory and Policy
- 307. Quantitative Analysis I
- 308. Quantitative Analysis II
- 311, 312. History of Political Economy
- 313, 314. Seminar in Economic Theory
- 316. Seminar in Economics of Soviet-Type Socialism
- 317. Seminar in Demographic, Population, and Resource Problems (Development Economics I)

- 319. Seminar in the Theory and the Problems of Economic Growth and Change (Development Economics II)
- 320. Macroeconomic Analysis I
- 322. Macroeconomic Analysis II
- 329. Federal Finance
- 330. Seminar in Public Finance
- 355. Seminar in Labor Economics
- 358. Seminar in Labor Market and Related Analysis
- 365. Seminar in International Trade Theory and Policy
- 366. Seminar in International Monetary Theory
- 388. Industrial Organization
- 389. Seminar in Industrial and Governmental Problems
- 397, 398. Directed Research

Courses Currently Unscheduled

- 231S. Analytical Economic History
- 247. Corporate Economics II
- 303. Theory of Economic Decision Making
- 318. Dissertation Seminar
- 321. Theory of Quantitative Economic Policy
- 323. Income Distribution Theory
- 331. Seminar in Economic History
- 345, 346. Demographic Techniques I and II
- 350. Seminar in Applied Economics
- 401. Seminar on the British Commonwealth
- 402. Interdisciplinary Seminar in the History of the Social Sciences

Related Courses in Other Departments

Courses in related fields may be selected from anthropology, computer science, forestry, history, mathematics, philosophy, political science, public policy studies, and sociology, or from an area that complements the candidate's area of research interests in economics.

Education

Associate Professor Lucy T. Davis, Ed.D. (Columbia), *Chairman*

Associate Professor Peter F. Carbone, Ed.D. (Harvard), *Director of Graduate Studies*

Professors

W. Scott Gehman, Jr., Ph.D. (Pennsylvania State); Ellis B. Page, Ed.D. (California at Los Angeles)

Associate Professors

Robert H. Ballantyne, Ed.D. (Washington State); Joseph Di Bona, Ph.D. (California at Berkeley); Charles B. Johnson, Ed.D. (Duke); David V. Martin, Ed.D. (Duke); Robert N. Sawyer, Ed.D. (Wyoming)

Assistant Professors

Mary E. Mayesky, Ph.D. (Wayne State); Michael L. Michlin, Ph.D. (Minnesota)

Adjunct Professor

Robert A. Pittillo, Jr., Ed.D. (Duke)

Lecturers

John A. Fowler, M.D. (Bowman Gray); Richard H. Leach, Ph.D. (Princeton)

Qualified juniors, seniors, and graduate students may enroll in appropriate education courses as electives. Further information may be obtained from the Director of Graduate Studies.

Courses of Instruction

- 205. Selected Topics
- 211. Education and the Mass Media
- 213. Elementary School Organization and Administration
- 215S. Secondary Education: Principles
- 216. Secondary Education: Internship
- 225. The Teaching of History and the Social Studies
- 227. Contemporary Theories of Counseling and Psychotherapy
- 232. Psychoeducational Counseling with Families
- 236. Teaching Developmental and Remedial Reading in the Secondary School
- 237. Teaching of Literature in Secondary Schools
- 239. Teaching of Grammar, Composition, Mechanics, and Usage in Secondary School
- 242. Group Counseling
- 246. Teaching of Mathematics
- 276. Teaching of High School Science
- 304. Internship in School Psychology
- 335, 336. Seminar in School Administration
- 350, 351. Directed Activities in Education
- 357. Directed Research

Courses Currently Unscheduled

- 203. Seminar in Philosophical Analysis of Educational Concepts
- 206. Studies in the History of Educational Philosophy
- 217. The Psychological Principles of Education
- 226. Teaching Developmental and Remedial Reading in the Elementary School
- 230. Research Methods in Education
- 234. Secondary School Organization and Administration
- 241. Counseling Psychology
- 248. Practicum in Counseling
- 258. Assessment of Personality, Interests, and Attitudes
- 267. Energy Use in Educational Facilities
- 270. Junior and Community College
- 271. Instructional Systems for College and University Teaching
- 277. Student Personnel Services in Higher Education

Engineering

Professor Earl H. Dowell, Ph.D. (Massachusetts Inst. of Tech.), *Dean*

The School of Engineering offers programs of study and research leading to the M.S. and Ph.D. degrees with a major in biomedical, civil and environmental, or electrical engineering, or in mechanical engineering and materials science. These programs are designed to provide a fundamental understanding of the engineering sciences, which are based on mathematics and the physical sciences, and to develop experience in the art of engineering, which includes strong elements of intuition, imagination, and judgment. Engineering graduate students may participate in seminars appropriate to their fields of study.

A minimum of 30 units of earned graduate credit beyond the bachelor's degree is required for the M.S. degree: 12 in the major, 6 in related minor work (usually mathematics or natural science), 6 in either the major or minor subject or in other areas approved by the major department, and 6 for a research-based thesis. A nonthesis

option requiring 30 units of course credit is available. Each of the departments imposes additional requirements in the exercise of this option. There is no language requirement for this degree.

A minimum of 60 units of earned graduate credit beyond the bachelor's degree is required for the Ph.D. degree. In civil and electrical engineering, 24 units are required in the major field and 12 units in a related minor field (often mathematics or natural science), 12 in either the major or minor subject or other areas approved by the major department, and 12 for a research-based dissertation. In biomedical and mechanical engineering there are no specific course requirements; each program is planned to meet individual needs. Doctoral students are required to pass qualifying and preliminary examinations which may be either written, oral, or a combination of written and oral components, at the discretion of the committee and the department.

Biomedical Engineering

Professor Howard G. Clark, Ph.D. (Maryland), *Chairman*

Professor Roger C. Barr, Ph.D. (Duke), *Director of Graduate Studies*

Professors

William E. Hammond, Ph.D. (Duke); Robert M. Hochmuth, Ph.D. (Brown); James H. McElhaney, Ph.D. (West Virginia); Loren W. Nolte, Ph.D. (Michigan); Theo C. Pilkington, Ph.D. (Duke); Frederick L. Thurstone, Ph.D. (North Carolina State); Myron L. Wolbarsht, Ph.D. (Johns Hopkins)

Associate Professors

Donald S. Burdick, Ph.D. (Princeton); Olaf T. von Ramm, Ph.D. (Duke)

Biomedical engineering is often defined as the application of the concepts and methods of the physical, mathematical, and engineering sciences to biology and medicine. Specific research topics range from formalized mathematical theory through experimental science to practical clinical applications. The purpose of the graduate program in biomedical engineering is to encourage combining engineering and biomedical course work with an interdisciplinary research topic so that the graduates of this program can contribute at the most advanced professional level. The major research areas available include: biomechanics, biomedical materials, biomedical modeling, data acquisition and processing, and electrophysiology. Every biomedical engineering graduate student is required to serve as a teaching assistant for one to three semesters.

Courses of Instruction

202. Biomedical Transfer Processes
204. Measurement and Control of Cardiac Electrical Events
205, 206. Microprocessors and Digital Instruments
215. Biomedical Materials and Artificial Organs
230. Biomechanics
243. Computers in Biomedical Engineering
265. Advanced Topics in Biomedical Engineering

333. Biomedical Imaging
399. Special Readings in Biomedical Engineering

Courses Currently Unscheduled

201. Analysis of Bioelectric Phenomena
207. Experimental Mechanics
221. Electrophysiological Techniques
311. Inverse Models

Civil and Environmental Engineering

Professor Robert J. Melosh, Ph.D. (Washington), *Chairman*

Associate Professor Henry J. Petroski, Ph.D. (Illinois), *Director of Graduate Studies*

Professors

Bruce J. Muga, Ph.D. (Illinois); Senol Utku, Sc.D. (Massachusetts Inst. of Tech.); P. Aarne Vesilind, Ph.D. (North Carolina at Chapel Hill); James F. Wilson, Ph.D. (Ohio State)

Associate Professors

Mrinmay Biswas, Ph.D. (Virginia); Miguel A. Medina, Jr., Ph.D. (Florida); J. Jeffrey Peirce, Ph.D. (Wisconsin)

Assistant Professors

Carlos M. Marin, Ph.D. (Harvard); Eric I. Pas, Ph.D. (Northwestern); Kenneth H. Reckhow, Ph.D. (Harvard)

Adjunct Professor

Edward A. Saibel, Ph.D. (Massachusetts Inst. of Tech.)

A student may specialize in one of the following fields of study for either the M.S. or the Ph.D. degree: environmental engineering; geotechnical engineering and soil mechanics; mechanics of solids; materials engineering; fluid mechanics, water resources, and ocean engineering; structural engineering; and urban systems and transportation. Interdisciplinary programs combining study in some of the major areas with biological sciences, business administration, materials science, social sciences, political science, public policy studies, and other areas of engineering are also available.

With the approval of the department, a master's degree candidate in civil engineering may choose, in lieu of submitting a thesis, to complete an additional 6 units of course work plus a special project. If this alternative is elected, candidates are expected to take comprehensive examinations over their graduate course work, and also to defend orally their special projects.

Under the Reciprocal Agreement with Neighboring Universities, a student may include as a portion of the minimum requirements work offered by the Department of Environmental Sciences and Engineering of the University of North Carolina. Although related work normally is taken in the natural sciences or mathematics, a student whose major interest relates to the social or managerial sciences may take relevant work in these areas.

Courses of Instruction

201. Advanced Mechanics of Solids
204. Plates and Shells
205. Elasticity
212. Mechanical Behavior of Materials
215. Urban and Regional Systems Analysis
216. Transportation Planning and Policy Analysis
217. Transportation Systems Analysis
218. Engineering Management and Project Evaluation
225. Dynamic Engineering Hydrology
226. Operational Hydrology
232. Reinforced Concrete Design
233. Prestressed Concrete Design
235. Foundation Engineering
236. Earth Structures
239. Physical Properties of Soils
241. Environmental Engineering Chemistry and Biology
243. Unit Operations in Water Treatment
245. Pollutant Transport Systems
246. Water Supply Design
248. Solid Waste and Resource Recovery Engineering
249. Control of Hazardous and Toxic Waste
251. Systematic Engineering Analysis
254. Applications of Finite Element Analysis

258. Analysis of Dynamic and Nonlinear Behavior of Structures
265. Advanced Topics in Civil Engineering
280. Engineering Aspects of Physical Oceanography
281. Experimental System Engineering
282. Port, Harbor, and Coastal Engineering
283. Ocean System Dynamics
399. Special Readings in Civil and Environmental Engineering

Courses Currently Unscheduled

202. Advanced Mechanics of Solids II
210. Intermediate Dynamics
221. Incompressible Fluid Flow
222. Open Channel Flow
223. Flow Through Porous Media
231. Structural Engineering Analysis
234. Advanced Structural Design in Metals
238. Rock Mechanics
247. Air Pollution Control
306. Plasticity
336. Advanced Soil Mechanics
337. Elements of Soil Dynamics
350. Advanced Engineering Analysis

Electrical Engineering

Professor H. Craig Casey, Jr., Ph.D. (Stanford), *Chairman*

Professor Peter N. Marinos, Ph.D. (North Carolina State), *Director of Graduate Studies*

Professors

Richard B. Fair, Ph.D. (Duke); William T. Joines, Ph.D. (Duke); Robert B. Kerr, Ph.D. (Johns Hopkins); Loren W. Nolte, Ph.D. (Michigan); Harry A. Owen, Jr., Ph.D. (North Carolina State); Theo C. Pilkington, Ph.D. (Duke); Paul P. Wang, Ph.D. (Ohio State); Thomas G. Wilson, Sc.D. (Harvard)

Associate Professors

Herbert Hacker, Ph.D. (Michigan); Kishor S. Trivedi, Ph.D. (Illinois)

Assistant Professors

Christopher R. Carroll, Ph.D. (Calif. Inst. of Tech.); Rhett T. George, Jr., Ph.D. (Florida)

A student may specialize in any one of the following fields in working toward either the M.S. or the Ph.D. degree with a major in electrical engineering: computer-aided design, computer engineering, detection and estimation theory, digital signal processing, electromagnetic fields and microwaves, integrated circuit design and fabrication, microprocessor systems, robotics and control systems, solid-state devices and materials, solid-state power conditioning, and VLSI circuit design.

Recommended prerequisites for the graduate courses in electrical engineering include a knowledge of basic mathematics and physics, electric networks, and system theory. Students in doubt about their background for enrollment in specific courses should discuss the matter with the Director of Graduate Studies. The M.S. degree program includes either a thesis or a project and an oral examination. A qualifying examination is required for the Ph.D. degree program. This examination is intended to test both the breadth and depth of the student's understanding of basic electrical engineering concepts. There is no foreign language requirement.

Courses of Instruction

- 203. Random Signals and Noise
- 204. Computer Network Architecture
- 205. Signal Detection and Extraction Theory
- 206. Digital Signal Processing
- 207. Fault-Tolerant Computer Systems
- 208. Digital Computer Design
- 209. Microprocessor Fundamentals and Applications
- 210. Introduction to VLSI Systems
- 211. Quantum Mechanics
- 213. Modern Optics
- 214. Introduction to Solid-State Physics
- 215. Semiconductor Physics
- 216. Devices and Processing for Integrated Circuits
- 218. Integrated Circuit Engineering
- 222. Nonlinear Analysis
- 224. Advanced Electronic Circuits
- 234. Power Electronics: High-Power Circuits
- 235. Nonlinear Magnetic and Semiconductor Power Converters: Design and Control I
- 236. Nonlinear Magnetic and Semiconductor Power Converters: Design and Control II
- 237, 238. Advanced Power Electronics Laboratory and Seminar
- 241. Linear Systems
- 242. Modern Control and Dynamic Systems

- 250. Introduction to Robotics
- 251. Pattern Classification and Recognition
- 252. Computer Systems Organization
- 265. Advanced Topics in Electrical Engineering
- 271. Electromagnetic Theory
- 272. Electromagnetic Communication Systems
- 305. Advanced Topics in Signal Processing
- 308. Advanced Topics in Digital Systems
- 310. Advanced VLSI Design
- 399. Special Readings in Electrical Engineering

Courses Currently Unscheduled

- 202. System Modeling and Computation
- 217. Lasers
- 226. Modeling and Computer-Aided Analysis of Electronic Systems
- 227. Network Synthesis
- 243. Advanced Linear Systems Theory
- 302. Applied Information Theory and Statistical Estimation
- 317. Quantum Electronics
- 324. Nonlinear Oscillations in Physical Systems
- 342. Optimal Control Theory
- 371. Advanced Electromagnetic Theory
- 373. Selected Topics in Field Theory

Mechanical Engineering and Materials Science

Professor Jack B. Chaddock, Sc.D. (Massachusetts Inst. of Tech.), *Chairman*

Associate Professor Edward J. Shaughnessy, Jr., Ph.D. (Virginia), *Director of Graduate Studies*

Professors

Franklin H. Cocks, Sc.D. (Massachusetts Inst. of Tech.); Devendra P. Garg, Ph.D. (New York Univ.); Charles M. Harman, Ph.D. (Wisconsin); George W. Pearsall, Sc.D. (Massachusetts Inst. of Tech.); Marion L. Shepard, Ph.D. (Iowa State)

Associate Professors

Ernest Elsevier, M.S. (Georgia Inst. of Tech.); Phillip L. Jones, Ph.D. (California at Los Angeles); Donald Wright, Ph.D. (Purdue)

Assistant Professors

Gale H. Buzzard, Ph.D. (North Carolina State); Kenneth C. Cadien, Ph.D. (Illinois); Timothy K. Hight, Ph.D. (Stanford)

Adjunct Associate Professor

Ish Sud, Ph.D. (Duke)

Graduate study is available to students seeking the M.S. and Ph.D. degrees with a major in either mechanical engineering or materials science. Departmental programs of advanced study and research include photovoltaics, control systems, dynamics and vibrations, energy conversion, fluid mechanics, heat and mass transport, mechanical design, thermodynamics, physical metallurgy, corrosion, fracture, and polymer science. The faculty cooperates with faculty members from a number of other departments and schools to establish interdisciplinary research projects and programs of study in areas which include applied mechanics, biomechanics, biomedical materials, environmental quality and control, ocean engineering, systems engineering, engineering and public policy, and transportation systems.

The program includes the opportunity for experimental work as well as theoretical study. A major emphasis is placed upon developing the research ability of the student and relating the program to the evolving needs of modern engineering practice.

Courses of Instruction

- 202. Engineering Thermodynamics
- 211. Theoretical and Applied Polymer Science
- 213. Advanced Materials Science
- 214. Corrosion and Corrosion Control
- 215. Biomedical Materials and Artificial Organs
- 216. Materials Science and Solar Technology
- 217. Fracture of Engineering Materials
- 218. Thermodynamics and Thermokinetics of Materials
- 219. Applied Surface Science: Crystal Growth and Analytical Techniques
- 221. Compressible Fluid Flow
- 222. Heat Transfer
- 223. Principles and Design of Heat Transfer Equipment
- 224. An Introduction to Turbulence
- 226. Intermediate Fluid Mechanics
- 227. Advanced Fluid Mechanics
- 230. Modern Control and Dynamic Systems
- 234. Advanced Computer-Aided Engineering
- 235. Advanced Mechanical Vibrations
- 236. Engineering Acoustics and Noise Control
- 240. Patent Technology and Law for Engineers
- 241. Advanced Mechanical Design

- 254. Solar Energy Thermal Processes
- 265. Advanced Topics in Mechanical Engineering
- 267. Energy Use in Educational Facilities
- 277. Optimization Methods for Mechanical Design
- 302. Advanced Thermodynamics
- 323. Convective Heat Transfer
- 324. Conduction and Radiation Heat Transfer
- 399. Special Readings in Mechanical Engineering

Courses Currently Unscheduled

- 210. Intermediate Dynamics
- 231. Systems Response and Control
- 232. Nonlinear Analysis
- 280. Nuclear Reactor Power Cycles
- 300. Advanced Projects in Mechanical Engineering
- 311. Behavior of Crystalline Solids
- 321. Gas Dynamics
- 322. Mechanics of Viscous Fluids
- 327. Homogeneous Turbulence
- 328. Turbulent Shear Flow
- 331. Nonlinear Control Systems
- 333. Seminar in Control Systems
- 335. Analytical Methods in Vibrations
- 372. Finite Element Techniques in Design

English

Professor Robert F. Gleckner, Ph.D. (Johns Hopkins), *Acting Chairman*

Associate Professor A. Leigh DeNeef, Ph.D. (Pennsylvania State), *Director of Graduate Studies*

Professors

Carl Anderson, Ph.D. (Pennsylvania); Louis J. Budd, Ph.D. (Wisconsin); Edwin H. Cady, Ph.D. (Wisconsin), *Andrew W. Mellon Professor in the Humanities*; Bernard I. Duffey, Ph.D. (Ohio State); Oliver W. Ferguson, Ph.D. (Illinois); Gerald Monsman, Ph.D. (Johns Hopkins); Holger O. V. Nygard, Ph.D. (California at Berkeley); Dale B. J. Randall, Ph.D. (Pennsylvania); Clyde de Loache Ryals, Ph.D. (Pennsylvania); Grover C. Smith, Ph.D. (Columbia); George W. Williams, Ph.D. (Virginia); Kenny J. Williams, Ph.D. (Pennsylvania)

Associate Professors

Ronald Richard Butters, Ph.D. (Iowa); Gerald E. Gerber, Ph.D. (Northwestern); Wallace Jackson, Ph.D. (Pennsylvania); Buford Jones, Ph.D. (Harvard); Elgin W. Mellow, Ph.D. (London); Victor H. Strandberg, Ph.D. (Brown)

Assistant Professor

Joseph A. Porter, Ph.D. (California at Berkeley)

Visiting Professor

D. W. Robertson, Ph.D. (North Carolina at Chapel Hill)

The department offers graduate work leading to the A.M. and Ph.D. degrees. A statement of the requirements for the A.M. and Ph.D. degrees may be obtained from the Director of Graduate Studies. The department requires a reading knowledge of one foreign language for the A.M. degree; for the Ph.D. degree, two languages determined by the student's committee.

Courses of Instruction

- 207. Old English Language and Literature
- 208. History of the English Language
- 209. Present-Day English
- 212. Middle English Literature: 1100 to 1500
- 221. Renaissance Prose and Poetry: 1500 to 1660
- 225. Renaissance Drama: 1500 to 1642
- 235. Restoration and Eighteenth-Century Literature: 1660 to 1800
- 241. Romantic Literature: 1790 to 1830
- 245. Victorian Literature: 1830 to 1900
- 251. British Literature since 1900
- 263. American Literature to 1865
- 267. American Literature: 1865 to 1915
- 275. American Literature since 1915
- 287. Major Critical Thought
- 312. Studies in Middle English Literature
- 315. Studies in Chaucer
- 321. Studies in Renaissance Literature
- 324. Studies in Shakespeare
- 329. Studies in Milton
- 337. Studies in Augustanism
- 338. Studies in a Major Augustan Author

- 341. Studies in Romanticism
- 347. Studies in Victorianism
- 348. Studies in a Major Nineteenth-Century Author
- 353. Studies in Modern British Literature
- 361. Studies in American Literature before 1915
- 375. Studies in Modern American Literature
- 376. Studies in a Modern Author (British or American)
- 381. Special Topics Seminar
- 383. Studies in Textual Criticism
- 385. Studies in Literary Criticism
- 390. Seminar in the Teaching of Composition
- 392. Tutorial in Journal Editing

Courses Currently Unscheduled

- 280. Introduction to Folklore
- 310. Studies in Old English Literature
- 368. Studies in a Major American Author before 1915
- 380. Studies in Ballad and Folksong

Tutorials

Specialized subjects of study will be offered, numbered in the 390s, to accommodate the interests of advanced graduate students. Tutorials will be offered to single students or to small groups. Instruction will be conducted in weekly sessions, or in more frequently scheduled sessions, if the instructor wishes. Emphasis will be on independent reading and investigation, and oral and written reports. A substantial amount of writing will be required.

Students are advised to consult the Director of Graduate Studies for a list of tutorials currently scheduled to be offered.

Forestry and Environmental Studies

Professor Benjamin A. Jayne, Ph.D. (Yale), *Dean*

Professor William J. Stambaugh, Ph.D. (Yale), *Director of Graduate Studies*

Professors

Robert L. Barnes, Ph.D. (Duke); Kenneth R. Knoerr, Ph.D. (Iowa); Jane Philpott, Ph.D. (Iowa); Charles W. Ralston, Ph.D. (Duke)

Associate Professors

Norman L. Christensen, Jr., Ph.D. (California at Santa Barbara); Curtis J. Richardson, Ph.D. (Tennessee); P. Aarne Vesilind, Ph.D. (North Carolina at Chapel Hill)

Assistant Professors

Robert T. Boyd, Ph.D. (California at Davis); William C. Davis, Ph.D. (Yale); Richard T. Di Giulio, Ph.D. (Virginia Polytechnic Inst.); William F. Hyde, Ph.D. (Michigan); Lynn A. Maguire, Ph.D. (Utah State); Carlos M. Marin, Ph.D. (Harvard); Kenneth H. Reckhow, Ph.D. (Harvard); Jack P. Royer, Ph.D. (Cornell)

Professors Emeriti

Roger F. Anderson, Ph.D. (Minnesota); Henry Hellmers, Ph.D. (California at Berkeley)

Adjunct Professors

Stephen G. Boyce, Ph.D. (North Carolina State); William K. Condrell, J.D. (Harvard); William J. Hart, M.P.A. (Harvard); William R. Sizemore, Ph.D. (Georgia)

Adjunct Associate Professor

George F. Dutrow, Ph.D. (Duke)

Adjunct Assistant Professor

J. Michael Vasievich, Ph.D. (Duke)

Research Associate

Daniel E. Binkley, Ph.D. (Oregon State)

Major and minor work is offered in the areas of natural resource science/ecology, natural resource systems science, and natural resource economics/policy. Programs of study and research lead to the A.M., M.S., and Ph.D. degrees. College graduates who have a bachelor's degree in one of the natural or social sciences, forestry, engineering, business, or environmental science will be considered for admission to a degree program. Students will be restricted to the particular fields of specialization for which they are qualified academically. Graduate School programs usually concentrate on some area of natural resource science/ecology, systems science, or economics/policy, while study in resource management is more commonly followed in one of the professional master's degree programs of the School of Forestry and Environmental Studies. For more complete program descriptions and information on professional training in forestry or environmental studies, the *Bulletin of Duke University: School of Forestry and Environmental Studies* should be consulted.

The specific degrees available in forestry and related natural resources through the Graduate School are: the A.M. (with or without a thesis), M.S. (with a thesis), and the Ph.D. Students majoring in forestry or environmental studies may be required to demonstrate satisfactory knowledge of one or two foreign languages for the Ph.D. degree. More information on degree and language requirements can be found in the degree requirements section of the bulletin.

Courses of Instruction

- 201. Field Studies
- 202. Student Projects
- 207. Biology of Forest Insects and Diseases
- 211. Resource Ecology and Ecosystem Analysis
- 212. Ecosystem Dynamics in Silviculture
- 213. Silviculture
- 214. Tree Biology
- 215. Forest Entomology
- 216. Forest Pathology
- 218. Barrier Island Ecology
- 220L. Soil Classification and Interpretation
- 221L. Silvics and Measurement of Forest Vegetation
- 224. Ecological Toxicology
- 226. Forest Ecosystems
- 230. Weather and Climate
- 231. Environmental Climatology
- 232. Microclimatology
- 234. Watershed Hydrology
- 236. Water Quality Management
- 238. Limnological Principles of Aquatic Resource Management
- 252. Computer Applications in Forestry
- 256. Remote Sensing for Resource Management
- 259. Computer Programming for Resource Management
- 260. Natural Resource Data Analysis
- 262. Applied Population Ecology
- 263. Harvesting and Transportation Systems
- 264. Manufacturing Systems
- 270. Resource Economics and Policy
- 283. Environmental Policy and Values
- 290. Practicums in Resource Management
- 299. Independent Projects
- 303. Seminar in Ecotoxicology
- 309. Chemical Aspects of Forest Protection
- 310. Forest Productivity and Mineral Cycling
- 311. Choices in Silviculture
- 313. Wildland and Wildlife Management
- 315. Ecology of Tree Diseases
- 316. Seminar in Forest Protection
- 317. Seminar in Integrated Case Studies in Natural Resource Analysis
- 318. Seminar in Forest Resource Management
- 319. Seminar in Natural Resource Ecology
- 324. Wetlands Ecology
- 325. Forest Yield
- 328. Forest Soil Fertility
- 330L. Environmental Monitoring and Instrumentation
- 331. Water Resource Systems
- 349. Integrated Case Studies in Toxicology
- 350. Statistical Estimation and Inference for Resource Management
- 353. Analysis of Resource Systems
- 354. Quantitative Ecology for Resource Management
- 355. Optimization Methods for Resource Management
- 368. Seminar in Water Quality Modeling
- 381. Natural Resource Policy
- 382. Environmental Perspectives: Risks, Rights, Regulations
- 388. Seminar in Resource and Environmental Policy

Courses Currently Unscheduled

- 312. Forest Biochemistry
- 322. Microbiology of Forest Soils
- 338. Micrometeorology and Biometeorology Seminar
- 377. Seminar in Natural Resource Allocation and Efficiency

The University Program in Genetics

Professor Nicholas Gillham, Ph.D. (Harvard), *Director*

Professors

D. Bernard Amos, M.D. (Guys Hospital, London); Janis Antonovics, Ph.D. (Univ. Coll. of North Wales); John E. Boynton, Ph.D. (California at Davis); Richard Burns, Ph.D. (Illinois); Sheila Counce, Ph.D. (Univ. of Edinburgh); Samson R. Gross, Ph.D. (Columbia); Walter R. Guild, Ph.D. (Yale); Wolfgang Karl Joklik, D. Phil. (Univ. of Oxford); James B. Duke Professor of Microbiology and Immunology; Montrose J. Moses, Ph.D. (Columbia); R. Bruce Nicklas, Ph.D. (Columbia); Calvin L. Ward, Ph.D. (Texas); Frances Ellen Ward, Ph.D. (Brown); Robert E. Webster, Ph.D. (Duke)

Associate Professors

Deepak Bastia, Ph.D. (Chicago); Ronald C. Greene, Ph.D. (California Inst. of Tech.); Paul L. Modrich, Ph.D. (Stanford)

Assistant Professors

Mary Vickers Burdett, Ph.D. (Georgetown); Sharyn Endow, Ph.D. (Yale); Arno L. Greenleaf, Ph.D. (Harvard); Michael S. Hershfield, M.D. (Pennsylvania); Edward W. Holmes, M.D. (Pennsylvania); Tao-shih Hsieh, Ph.D. (California at Berkeley); Nicholas M. Kredich, M.D. (Michigan); Frederick H. Schachat, Ph.D. (Stanford); Deborah A. Steege, Ph.D. (Yale); Marcy K. Uyenoyama, Ph.D. (Stanford)

Adjunct Professors

John W. Drake, Ph.D. (California Inst. of Tech.); Burke H. Judd, Ph.D. (California Inst. of Tech.); John Charles Lucchesi, Ph.D. (California at Berkeley)

The University Program in Genetics provides a coherent course of study in all facets of biology related to genetics. Graduate students registered in any of the biological sciences departments may apply to the faculty of the genetics program to pursue study and research leading to an advanced degree. It would be helpful if applicants for admission to the Graduate School indicated their interest in the genetics program at the time of application. Requests for information describing more completely the research interests of the staff, facilities, and special stipends and fellowships should be addressed to the Director, Genetics Program (Department of Zoology).

Courses of Instruction

- | | |
|---|------------------------------|
| 215. Molecular Genetics I: Genetic Mechanisms | 285. Ecological Genetics |
| 264S. Chromosomes, DNA, and Evolution | 286. Evolutionary Mechanisms |
| 268. Molecular Biology II: Nucleic Acids | 336. Immunogenetics |
| 280. Principles of Genetics | 350. Genetics Colloquium |
| 283. Extrachromosomal Inheritance | |

Geology

Professor Ronald D. Perkins, Ph.D. (Indiana), *Chairman*
Professor S. Duncan Heron, Jr., Ph.D. (North Carolina at Chapel Hill), *Director of Graduate Studies*

Professor

Orrin H. Pilkey, Ph.D. (Florida State)

Associate Professor

Bruce R. Rosendahl, Ph.D. (California at San Diego)

Assistant Professor

Paul A. Baker, Ph.D. (California at San Diego)

The Department of Geology offers graduate work leading to the M.S. and Ph.D. degrees. An undergraduate degree in geology is not a prerequisite for graduate studies, but a student must have had or must take a summer field geology course (or equivalent experience), mineralogy, lithology, stratigraphy, paleontology, and structural geology. In addition, the student must have had one year of college chemistry, one year of college physics, and mathematics through calculus.

Graduate courses in the Department of Geology provide specialized training in the fields of facies analysis, geological oceanography, sedimentary petrology, paleobiology, geophysics, and low-temperature geochemistry.

An acceptable thesis is required. There is no language requirement for the M.S. degree.

Courses of Instruction

- | | |
|--|--|
| 200. Beach and Coastal Processes | 230. Principles of Structural Geology |
| 205. Geological Oceanography | 243S. Microfossils |
| 206S. Principles of Geological Oceanography | 247. Paleocology |
| 208S. Paleooceanography | 250. Introduction to Marine Geophysics |
| 211S. Stratigraphic Principles and Application | 251. Physics of the Earth |
| 212. Carbonate Facies Analysis: Recent and Ancient | 252. Exploration Seismology |
| 214S. Sedimentary Petrography | 253S. Geophysics |
| 215. Clastics Facies Analysis: Recent and Ancient | 254. Geophysical Field Methods |
| 216. Field Analysis of South Florida Carbonates | 260S. Hydrocarbon Exploration |
| 217. Field Analysis of Ancient Sedimentary Sequences | 270. Geochemistry |
| 229. Economic Geology | 271. Low-Temperature Geochemistry |
| | 371, 372. Advanced Topics in Geology |

Germanic Languages and Literature

Associate Professor Frank Borchardt, Ph.D. (Johns Hopkins), *Chairman and Director of Graduate Studies*

Professor

Leland R. Phelps, Ph.D. (Ohio State)

Associate Professors

A. Tilo Alt, Ph.D. (Texas); James L. Rolleston, Ph.D. (Yale)

Assistant Professor

Donald K. Rosenberg, Ph.D. (Ohio State)

Visiting Professor

Harold R. Jantz, Ph.D. (Wisconsin)

The Department of Germanic Languages and Literature offers graduate work leading to the A.M. degree. Students who expect to major in German should have had sufficient undergraduate courses in Germanic languages to enable them to proceed to more advanced work.

Students who wish to take courses in German as a related field should normally have completed a third-year course (in exceptional cases, a second year) of college German with acceptable grades.

Courses of Instruction

200S. Proseminar
201S, 202S. Goethe
205, 206. Middle High German
207S. German Romanticism
209S. Drama
211S. Nineteenth-Century Literature
213S. Hofmannsthal-Rilke-Benn
214S. The Twentieth Century
215S. Seventeenth-Century Literature

216. History of the German Language
217S. Renaissance and Reformation Literature
218S. The Teaching of German
219. Applied Linguistics
230S. Lyric Poetry

Courses Currently Unscheduled

301. Gothic
321, 322. Germanic Seminar

Health Administration

Professor James P. Cooney, Jr., Ph.D. (Minnesota), *Chairman and Director of Graduate Studies*

Professors

E. Harvey Estes, Jr., M.D. (Emory); B. Jon Jaeger, Ph.D. (Duke); David G. Warren, J.D. (Duke)

Associate Professors

David J. Falcone, Ph.D. (Duke); Louis E. Swanson, A.B. (Hamilton); David Michael Warner, Ph.D. (Tulane)

Assistant Professor

Donald S. Smith II, M.H.A. (Minnesota)

Adjunct Professors

Arnold D. Kaluzny, Ph.D. (Michigan); Richard J. Stull, B.A. (Duke); Robert E. Toomey, LL.D. (Clemson); Edward L. Walls, Jr., Ph.D. (Harvard)

Adjunct Assistant Professors

Deborah A. Freund, Ph.D. (Michigan); Robert G. Winfree, M.A. (Iowa)

Associate

Douglas Henderson-James, M.H.A. (Duke)

The Department of Health Administration offers graduate work leading to the M.H.A. degree. The graduate program is offered through two academic years and leads principally toward a career in the corporate management of complex health care delivery organizations. Students without previous administrative experience in the health field are encouraged to apply for a twelve-month administrative fellowship following graduation. Admission to this program is based upon the capability for graduate study and demonstrated leadership potential of the candidate.

Courses of Instruction

- 300. Introduction to Medical Care
- 301, 302. The Health System and Its Environment
- 312. Comparative Health Systems
- 313. Quantitative Decision Making
- 321. Organizational Behavior in Health Systems
- 322. Design of Health Service Organizations
- 326. Health Economics
- 331. Planning Health Services: Systems Planning
- 332. Institutional and Facilities Planning
- 333. Financial Management for Health Organizations
- 340. Social Dimensions of Illness
- 344. Personnel Management
- 345. Public Policy and Health Care
- 348. Legal Considerations in Health Administration
- 350. Practicum in Health Services Administration
- 352. Ambulatory Health Services
- 360. Current Topics in Health Administration
- 361, 362. Case Studies in Health Administration
- 363. Health Administration Game
- 367. Multi-Institutional Arrangements
- 371, 372. Directed Research

- 373. Current Legal Problems in Health Administration
- 377. Research Design and Data Analysis
- 383. Program Development, Monitoring, and Evaluation
- 387. Information Systems
- 388. Technology
- 389. Corporate Planning for Health Services Organizations

Management Sciences Courses for Students in Health Administration

- 300. Managerial Economics
- 310. Quantitative Methods
- 311. Statistical Analysis for Management Decisions
- 330. Financial Accounting
- 331. Managerial Accounting
- 333. Controllership
- 351. Financial Management

Courses Currently Unscheduled

- 351. Institutional Health Services
- 353. Community Health Services

History

Professor Anne Firor Scott, Ph.D. (Radcliffe), *William K. Boyd Professor of History and Chairman*
 Professor Warren Lerner, Ph.D. (Columbia), *Director of Graduate Studies*

Professors

Clark R. Cahow, Ph.D. (Duke); John Cell, Ph.D. (Duke); William Chafe, Ph.D. (Columbia); Joel G. Colton, Ph.D. (Columbia); Calvin D. Davis, Ph.D. (Indiana); Robert F. Durden, Ph.D. (Princeton); John Hope Franklin, Ph.D. (Harvard), *James B. Duke Professor of History*; Irving B. Holley, Jr., Ph.D. (Yale); Seymour Mauskopf, Ph.D. (Princeton); John F. Oates, Ph.D. (Yale); John F. Richards, Ph.D. (California at Berkeley); William E. Scott, Ph.D. (Yale); John J. TePaske, Ph.D. (Duke); Richard L. Watson, Ph.D. (Yale); Ronald Witt, Ph.D. (Harvard); Charles R. Young, Ph.D. (Cornell)

Associate Professors

Charles W. Bergquist, Ph.D. (Stanford); John Crellin, Ph.D. (Univ. of London); Arif Dirlik, Ph.D. (Rochester); Raymond Gavins, Ph.D. (Virginia); Lawrence C. Goodwyn, Ph.D. (Texas); Martin Miller, Ph.D. (Chicago); Sydney Nathans, Ph.D. (Johns Hopkins); Alex Roland, Ph.D. (Duke); Peter H. Wood, Ph.D. (Harvard)

Assistant Professors

Peter C. English, M.D., Ph.D. (Duke); Thomas M. Huber, Ph.D. (Chicago); Bruce R. Kuniholm, Ph.D. (Duke); William M. Reddy, Ph.D. (Chicago)

Visiting Assistant Professor

David B. Gaspar, Ph.D. (Johns Hopkins)

Lecturer

Martin Bronfenbrenner, Ph.D. (Chicago)

The Department of History offers graduate work leading to the A.M. and Ph.D. degrees. Candidates for the A.M. degree must have a reading knowledge of at least one ancient or modern foreign language related to their programs of study and have completed successfully a substantial research paper, normally the product of a year's seminar or two semester courses. The paper must be approved by two readers—the supervising professor and a second professor from the graduate staff. Students anticipating a May degree must have their papers read and approved by April 15; those anticipating a September degree must have their papers read and approved by August 1.

Candidates for the degree of Doctor of Philosophy are required to prepare themselves for examinations in four fields. Three usually shall be history. The choice of fields is determined in consultation with the student's supervisor and the Director of Graduate Studies. The department offers graduate instruction in the fields of Africa, Afro-American history, ancient history, medieval and early modern Europe, modern Europe, American history, Britain and the Commonwealth, Imperial Russia, Soviet Russia, Latin America, South Asia, modern China, modern Japan, military history, history of science, and history of medicine. The candidate for the Ph.D. degree usually must have a reading knowledge of two foreign languages, but in certain cases where the candidate's supervisor and the Director of Graduate Studies approve, and where the candidate's research for the dissertation would appreciably benefit, an alternative to the second language may be accepted. This alternative usually would take the form of successfully completed formal training in an auxiliary discipline (such as statistics or a course in one of the other social sciences with an emphasis upon methodology) of 3 to 6 units, or the equivalent, depending on the student's program. It also must be in addition to any previous undergraduate work in the discipline. The requirement, whether satisfied by two languages or by one language and an alternative, must be met prior to the preliminary examination.

Ancient History. For courses in ancient history which may be taken for credit in either history or classical studies, see Classical Studies.

Courses of Instruction

- | | |
|---|---|
| 201S. Aspects of Change in Prerevolutionary Russia | 236. The Reconstruction Era |
| 202S. Russian Anarchism: Theory and Practice | 237S. Europe in the Early Middle Ages |
| 205S. Progressive Era in the United States and World War I | 238S. Europe in the High Middle Ages |
| 206S. The Nineteen-Twenties and the New Deal in the United States | 239. History of Socialism and Communism |
| 212. Recent Interpretations of United States History | 243-244. Marxism and History |
| 213. Medicine and Society in America | 247. History of Modern India and Pakistan, 1707-1857 |
| 215-216. The Diplomatic History of the United States | 248. History of Modern India and Pakistan, 1857 to the Present |
| 219S, 220S. History of Science and Technology | 249-250. Social and Intellectual History of the United States |
| 221. Problems in the Economic and Social History of Europe, 1200-1700 | 253S, 254S. Foreign Relations of the European Powers, 1871-1945 |
| 224S. Seminar in Legal History | 260S. Economic History of Japan |
| 225. American Legal History | 261-262. Problems in Soviet History |
| 226S. Seminar in Legal Biography | 265S. Problems in Modern Latin-American History |
| 227-228. Recent United States History: Major Political and Social Movements | 267S-268S. From Medieval to Early Modern England |
| 229S, 230S. Revolution in Modern Europe, 1789-1919 | 269S-270S. British History, Seventeenth Century to the Present |
| 231S, 232S. Problems in the History of Spain and the Spanish Empire | 273S, 274S. Topics in the History of Science |
| 234S. Political Economy of Development: Theories of Change in the Third World | 277S. The Coming of the Civil War in the United States, 1820-1861 |
| 235. The Antebellum South | 278S. The Civil War in the United States and Its Aftermath, 1861-1900 |
| | 282S. Canada |
| | 285S, 286S. Oral History |

301-302. Research Seminar in History
 307-308. Seminar in United States History
 312. Seminar in the Teaching of History in College
 314. Historical and Social Science Methodology
 351-352. Colloquia
 371-372. Research Seminars
 392. Tutorial in Journal Editing
 399. Independent Study

Courses Currently Unscheduled

204. The Uses of History in Public Policy: II
 207S, 208S. The Development of Urban America
 209S, 210S. Topics in Afro-American History, 1619-Present

218S. Twentieth-Century Europe: Social and Economic Issues
 222. Problems in European Intellectual History, 1250-1550
 255S-256S. Problems in African History
 287S, 288S. History of Japan
 297S. The British Empire of the Nineteenth Century
 298S. The Commonwealth in the Twentieth Century
 317, 318. Seminar in the History of Western Europe
 401. Seminar on the British Commonwealth

Humanities—The Master of Arts Program

Associate Professor Peter Burian, Ph.D. (Princeton), *Director*

The Master of Arts Program in Humanities is an interdepartmental program and is tailored to the needs of individual students. The candidate defines a theme and selects appropriate course work with the aid and approval of a supervising committee. Thirty units of course work are required for completion of the program. There is no thesis requirement, but the candidate submits at least two substantial papers arising from course work for review by committee members, and meets with them to discuss his or her program in a final master's colloquium. A noncredit introductory seminar, *Humanities as Ways of Knowing*, will be offered to all participants in the program.

The program is open to holders of undergraduate degrees in any discipline who can demonstrate sufficient background in humanities to permit study at the graduate level. Admission is by regular application to the Graduate School. Students may enroll full-time or part-time (minimum of 6 units per term). Students considering entering the program may enroll in an appropriate graduate course or courses through the Office of Continuing Education, at the same time making their interest known to the Director of the humanities program.

Literature—The Ph.D. Program

Associate Professor James L. Rolleston, Ph.D. (Yale), *Chairman and Director of Graduate Studies*

Professors

Bernard I. Duffey, Ph.D. (Ohio State); Magnus J. Krynski, Ph.D. (Columbia); Francis Newton, Ph.D. (North Carolina at Chapel Hill); Clyde de Loache Ryals, Ph.D. (Pennsylvania); Phillip Stewart, Ph.D. (Yale); Marcel Tetel, Ph.D. (Wisconsin); Bruce W. Wardropper, Ph.D. (Pennsylvania); George W. Williams, Ph.D. (Virginia)

Associate Professors

Frank Borchardt, Ph.D. (Johns Hopkins); Peter Burian, Ph.D. (Princeton); Ernesto Caserta, Ph.D. (Harvard); A. Leigh DeNeef, Ph.D. (Pennsylvania State); Miguel Garci-Gómez, Ph.D. (Catholic Univ.); Linda Orr, Ph.D. (Yale); Jean-Jacques Thomas, Doctorat de 3e Cycle (Univ. of Paris)

Assistant Professor

Gustavo F. Pérez, Ph.D. (Michigan)

The interdepartmental program leading to a Ph.D. in literature offers to qualified students the opportunity to develop individual course sequences combining a series of core courses with selected courses in one or more of the departments of national literatures. Students entering the program must present evidence of ability to read

two languages other than English, modern or classical; students commanding only one foreign language will learn a second during the first year of graduate study. The two-year program of courses includes a tutorial requirement: at least three courses must be taken on a tutorial basis, so that the student can rapidly acquire both specific research skills and broad perspectives on questions of literary theory and methodology.

Students' programs will be structured in consultation with the Committee for the Ph.D. in Literature. This committee, drawn from several literature departments, directs the program and advises students at every stage. More information on the program is provided in the section on special programs in this bulletin; and a full descriptive brochure is available from Dr. James L. Rolleston, Department of Germanic Languages and Literature.

Courses of Instruction

301. Introduction to the Graduate Study of Literature

302. Criticism and Literary Theory in the Twentieth Century

303. Special Topics in Structure, Genre, and Periodization

304. Philology, Linguistics, and the Roots of Literature

Marine Sciences—The University Program

Professor John Costlow, Ph.D. (Duke), *Director*

Associate Professor Joseph S. Ramus, Ph.D. (California at Berkeley), *Assistant Director for Academic Programs and Director of Graduate Student Affairs*

Professors

Richard T. Barber, Ph.D. (Stanford); John Gutknecht, Ph.D. (North Carolina at Chapel Hill); Orrin Pilkey, Ph.D. (Florida State); Richard A. White,* Ph.D. (Michigan)

Associate Professors

Richard B. Forward, Ph.D. (California at Santa Barbara); David R. McClay,* Ph.D. (North Carolina at Chapel Hill); Bruce R. Rosendahl,* Ph.D. (California at San Diego); Richard B. Searles,* Ph.D. (California at Berkeley); J. Bolling Sullivan, Ph.D. (Texas); John P. Sutherland, Ph.D. (California at Berkeley)

Professor Emeritus

Cazlyn Green Bookhout, Ph.D. (Duke)

Assistant Medical Research Professors

Celia Bonaventura, Ph.D. (Texas); Joseph Bonaventura, Ph.D. (Texas)

Graduate students from any and all academic disciplines are encouraged to take professional training at the Marine Laboratory. The program operates year-round, providing course work in the marine sciences, an active seminar program, and facilities supporting dissertation research. Presently, resident graduate students number fifteen and represent the Departments of Biochemistry, Botany, Physiology, and Zoology. Ordinarily, dissertation advisers are resident as well, although this need not be the case. The Marine Laboratory has available five full-time teaching assistantships for graduate student support. In addition, tuition credits obtained from fellowship support may be applied to courses given both at the Marine Laboratory and the Durham campus.

Persons interested in graduate work in marine sciences should apply through one of the appropriate departments. Forms may be obtained from the Graduate School.

Applications for summer courses at the laboratory should be addressed to the Admissions Office, Duke University Marine Laboratory, Beaufort, North Carolina

*In residence during summer only.

28516. The form may be obtained from the *Bulletin of Duke University: Marine Laboratory*. The application for enrollment in the Duke University summer session should be accompanied by transcripts of undergraduate and graduate work. Applications should be received as early as possible. Graduate students planning to enroll in courses or seminars offered during the fall or spring at the Marine Laboratory should notify the Admissions Office of the Marine Laboratory of such intent *prior* to the beginning of the respective term.

Students registering for research should do so under the appropriate departmental numbers.

The following courses are offered at Beaufort. See the Marine Laboratory bulletin for the current schedule of courses.

Courses of Instruction

Summer Program at Beaufort

- 203L. Marine Ecology
- 205. Geological Oceanography
- 215L. Primary Productivity in the Seas
- 218. Barrier Island Ecology
- 219L. Benthic Marine Algae
- 244L. Diversity of Plants
- 247L. Plant Ecology
- 250L. Physiology of Marine Animals
- 263L. Tropical Seaweeds
- 274L. Marine Invertebrate Zoology
- 276. Comparative and Evolutionary Biochemistry
- 278L. Invertebrate Developmental Biology
- 353, 354. Research
- 359, 360. Research

Fall Program at Beaufort

- 209. Independent Study
- 245L. Macromolecules, Ecology, and Evolution Seminar

Spring Program at Beaufort

- 210. Independent Study Seminar

Courses Currently Unscheduled

- 204L. Marine Microbiology
- 220L. Adaptations of Organisms to the Marine Environment
- 250. Introduction to Marine Geophysics
- 293. Ecological Basis for Coastal Area Planning and Management

Mathematics

Professor Michael C. Reed, Ph.D. (Stanford), *Chairman*

Professor William K. Allard, Ph.D. (Brown), *Director of Graduate Studies*

Professors

Ronald J. DiPerna, Ph.D. (New York Univ.); David G. Schaeffer, Ph.D. (Massachusetts Inst. of Tech.); Joseph R. Schoenfield, Ph.D. (Michigan); Seth L. Warner, Ph.D. (Harvard); Morris Weisfeld, Ph.D. (Yale)

Associate Professors

Donald S. Burdick, Ph.D. (Princeton); Richard E. Hodel, Ph.D. (Duke); Joseph W. Kitchen, Jr., Ph.D. (Harvard); David P. Kraines, Ph.D. (California at Berkeley); Lawrence C. Moore, Jr., Ph.D. (California Inst. of Tech.); William L. Pardon, Ph.D. (Princeton); Maria E. Schonbek, Ph.D. (Michigan); Richard A. Scoville, Ph.D. (Yale); David A. Smith, Ph.D. (Yale)

Assistant Professors

Daniel E. Flath, Ph.D. (Harvard); Gregory F. Lawler, Ph.D. (Princeton); Chadmark L. Schoen, Ph.D. (Chicago); Michael Shearer, D.Phil. (Univ. of Oxford); John Sylvester, Ph.D. (Courant Inst. of Math. Sci.); Robert L. Wolpert, Ph.D. (Princeton); Christopher G. Wright, Ph.D. (Stanford)

Adjunct Professors

Leon Bernstein, Ph.D. (State Univ. of Vilnius); Jagdish Chandra, Ph.D. (Rensselaer)

Graduate work in the Department of Mathematics is offered leading to the M.S., A.M., and Ph.D. degrees. Admission to these programs is based on the applicant's undergraduate academic record, level of preparation for graduate study, the Graduate Record Examination, and letters of recommendation.

All A.M. and Ph.D. candidates are required to pass a qualifying examination after completing their first year of graduate study. The A.M. degree with a major in mathematics is awarded upon completion of 30 units of graded course work and passing the qualifying examination. A thesis may be substituted for 6 units of course work only under special circumstances. The department also offers a program in applied statistics with a minor in computer science leading to the M.S. degree.

Candidacy for the Ph.D. is established by passing the qualifying examination at the Ph.D. level, completing the department's language requirements, and passing an oral preliminary examination. The preliminary examination is normally taken at the beginning of the third year. The preliminary examination is conducted by a committee selected by the rules of the Graduate School and the department. The examination can, at the student's option, consist of either questions based on the student's course work at Duke or on the specific area of research plus a minor subject selected by the student.

After admission to candidacy, the Ph.D. degree is awarded on the basis of the student's scholarly ability as demonstrated by the dissertation and its defense. The dissertation is the most important requirement in the award of the Ph.D. degree.

Courses of Instruction

200. Introduction to Algebraic Structures I
 201. Introduction to Algebraic Structures II
 203. Basic Analysis I
 204. Basic Analysis II
 205. Topology
 206. Differential Geometry
 221, 222. Numerical Analysis I, II
 230. Mathematical Methods in Physics and Engineering I
 231. Mathematical Methods in Physics and Engineering II
 234. Mathematics for Quantum Mechanics
 235. Topics in Mathematical Physics
 238, 239. Topics in Applied Mathematics
 240. Applied Stochastic Processes
 241. Linear Models
 242. Multivariate Statistics
 248, 249. Topics in Statistics
 250. Introductory Mathematical Logic
 251. Set Theory I
 258, 259. Topics in Logic
 260. Groups, Rings, Modules
 261. Commutative Algebra
 268, 269. Topics in Algebra

271. Algebraic Topology
 278, 279. Topics in Topology
 280. Differential Analysis
 281. Real Analysis I
 282. Real Analysis II
 283. Linear Operators
 285. Complex Analysis
 286. Topics in Complex Analysis
 288, 289. Topics in Analysis
 290. Probability
 297. Fourier Analysis and Distribution Theory
 298. Partial Differential Equations I
 387. Current Research in Mathematical Physics
 388, 389. Current Research in Analysis

Courses Currently Unscheduled

252. Set Theory II
 284. Topics in Functional Analysis
 293, 294. Topics in Probability Theory
 299. Partial Differential Equations II
 358-359. Current Research in Logic
 368-369. Current Research in Algebra
 378-379. Current Research in Topology

Program in Medieval and Renaissance Studies

Professor David Curtis Steinmetz, Th.D. (Harvard), *Chairman*
 Associate Professor Rona Goffen, Ph.D. (Columbia), *Director of Graduate Studies*

The graduate Program in Medieval and Renaissance Studies is an interdisciplinary program administered by the Duke University Center for Medieval and Renaissance Studies. In consultation with the Director of Graduate Studies, students in the program select courses in art, history, music, philosophy, religion, and language and literature (classical studies, English, German, and Romance languages). The program is described in the section on special programs; for a description of individual courses see the large *Bulletin of Duke University: Graduate School*.

Courses of Instruction

Department of Art

- 230S. Medieval and Byzantine Art and Architecture
- 232S. Romanesque and Gothic Art and Architecture
- 240. Italian Art
- 242S. Studies in Italian Renaissance Art

Department of Classical Studies

- 221. Medieval Latin
- 312. Proseminar in Latin Paleography

Department of English

- 207. Old English Language and Literature
- 208. History of the English Language
- 212. Middle English Literature: 1100 to 1500
- 221. Renaissance Prose and Poetry: 1500 to 1660
- 225. Renaissance Drama: 1500 to 1642
- 310. Studies in Old English Literature
- 312. Studies in Middle English Literature
- 315. Studies in Chaucer
- 321. Studies in Renaissance Literature
- 324. Studies in Shakespeare
- 329. Studies in Milton
- 380. Studies in Ballad and Folksong
- 383. Textual Criticism

Department of Germanic Languages and Literature

- 205, 206. Middle High German
- 215S. Seventeenth-Century Literature
- 216. History of the German Language
- 217S. Renaissance and Reformation Literature

Department of History

- 221. Problems in the Economic and Social History of Europe, 1200-1700
- 222. Problems in European Intellectual History, 1250-1550
- 237S. Europe in the Early Middle Ages
- 238S. Europe in the High Middle Ages
- 267S-268S. From Medieval to Early Modern England

Department of Music

- 201. Bibliography
- 211. Medieval Notation
- 212. Renaissance Notation
- 221. Monophonic Music
- 222. Music in the Middle Ages: Polyphony
- 223. Music in the Renaissance
- 311S. Seminar in Medieval Music
- 312S. Seminar in Renaissance Music
- 351S. Studies in Musical Iconography

Department of Philosophy

- 218S. Medieval Philosophy
- 219S. Late Medieval and Renaissance Philosophy

Department of Religion

- 219. Augustine
- 236. Luther and the Reformation in Germany
- 241. Problems in Reformation Theology
- 334. Theology and Reform in the Later Middle Ages
- 338. Calvin and the Reformed Tradition
- 339. The Radical Reformation

Department of Romance Languages

French

- 211. History of the French Language
- 240. Old French Literature
- 248. French Literature of the Seventeenth Century
- 345. French Prose of the Sixteenth Century
- 346. Topics in Renaissance Poetry
- 391, 392. French Seminar (medieval and Renaissance topics)

Italian

- 284. Dante
- 285. Dante

Spanish

- 210. History of the Spanish Language
- 251. The Origins of Spanish Prose Fiction
- 253. Cervantes
- 254. Drama of the Golden Age
- 258. Spanish Lyric Poetry before 1700
- 391, 392. Hispanic Seminar (medieval and Renaissance topics)

Courses Currently Unscheduled

- Classical Studies 306. Latin Seminar VI
- Classical Studies 327. Seminar in Byzantine History
- English 210. Old English Literary Tradition
- History 221. Problems in the Economic and Social History of Europe, 1200-1700
- Religion 206. Christian Mysticism in the Middle Ages
- Religion 251. The Counter-Reformation and the Development of Catholic Dogma
- Religion 344. Zwingli and the Origins of Reformed Theology

Microbiology and Immunology

Professor Wolfgang Karl Joklik, D.Phil. (Univ. of Oxford), *James B. Duke Professor of Microbiology and Immunology and Chairman*

Professor Hilda Pope Willett, Ph.D. (Duke), *Director of Graduate Studies*

Professors

D. Bernard Amos, M.D. (Guys Hospital, London), *James B. Duke Professor of Immunology*; Dani P. Bolognesi, Ph.D. (Duke); Rebecca Buckley, M.D. (North Carolina at Chapel Hill); Richard O. Burns, Ph.D. (Illinois); Eugene D. Day, Ph.D. (Delaware); Richard S. Metzgar, Ph.D. (Buffalo); Suydam Osterhout, M.D. (Duke), Ph.D. (Rockefeller Inst.); Wendell F. Rosse, M.D. (Chicago); David W. Scott, Ph.D. (Yale); Hilliard F. Seigler, M.D. (North Carolina at Chapel Hill); Ralph Snyderman, M.D. (SUNY, Downstate Med. Ctr.); Thomas C. Vanaman, Ph.D. (Duke); Frances E. Ward, Ph.D. (Brown); Robert W. Wheat, Ph.D. (Washington)

Associate Professors

Deepak Bastia, Ph.D. (Chicago); Jeffrey J. Collins, Ph.D. (Harvard); Ronald B. Corley, Ph.D. (Duke); Peter Cresswell, Ph.D. (Univ. of London); Jeffrey R. Dawson, Ph.D. (Case Western Reserve); Thomas G. Mitchell, Ph.D. (Tulane); Harvey J. Sage, Ph.D. (Yale)

Assistant Professors

Dolph O. Adams, M.D., Ph.D. (North Carolina at Chapel Hill); C. Edward Buckley III, M.D. (Duke); John C. Cambier, Ph.D. (Iowa); Sharyn Endow, Ph.D. (Yale); Jack D. Keene, Ph.D. (Washington at Seattle); David R. McClay, Ph.D. (North Carolina at Chapel Hill); David S. Pisetsky, M.D., Ph.D. (Albert Einstein)

Associate Medical Research Professor

Hillel S. Koren, Ph.D. (Univ. of Freiburg)

Assistant Medical Research Professors

Mary Vickers Burdett, Ph.D. (Georgetown); William J. Hubbard, Ph.D. (Iowa State); Sara E. Miller, Ph.D. (Georgia); W. David Sedwick, Ph.D. (Pennsylvania)

The department offers graduate work leading to the Ph.D. degree. Specialization is possible in molecular virology, viral oncology, cell biology, tumor biology, molecular microbiology, molecular genetics, immunochemistry, immunogenetics, cancer immunology, general immunology, and medical mycology.

Undergraduate preparation in the biological and physical sciences and in biochemistry is required. A brochure describing the Ph.D. degree program, prerequisites for admission, and research in the department can be obtained by writing the Director of Graduate Studies, Box 3020, Duke University Medical Center, Durham, North Carolina 27710.

Courses of Instruction

- 214. Fundamentals of Electron Microscopy
- 216. Experimental Immunochemistry
- 219. Molecular and Cellular Bases of Differentiation
- 219S. Seminar
- 221. Medical Microbiology
- 233. Principles of Microbiology and Immunology
- 234. Introduction to Biostatistical Methods
- 236. Statistical Methods in Human Genetics
- 238. Intermediate Biostatistics and Data Analysis
- 244. Principles of Immunology
- 252. General Virology and Viral Oncology
- 259. Molecular Biology I: Protein and Membrane Structure/Function
- 260S. Interactions of Differentiated Cells
- 264S. Chromosomes, DNA, and Evolution
- 268. Molecular Biology II: Nucleic Acids

- 269. Advanced Cell Biology
- 291. Basic Immunology
- 296. Contemporary Molecular Immunology
- 323. Readings in Microbiology and Immunology
- 325. Medical Mycology
- 330. Medical Immunology
- 331.1-331.8. Microbiology Seminar
- 332.1-332.8. Immunology Seminar
- 336. Immunogenetics
- 337. Immunobiology of the Macrophage

Courses Currently Unscheduled

- 242. Mechanisms of Microbial Pathogenicity
- 282. Molecular Microbiology
- 420. Cellular Immunophysiology

Music

Professor Fenner Douglass, M.Mus. (Oberlin), *Chairman*
Associate Professor R. Larry Todd, Ph.D. (Yale), *Director of Graduate Studies*

Professor

Warren Kirkendale, Ph.D. (Univ. of Vienna)

Associate Professor

Tilman Seebass, Ph.D. (Univ. of Basel)

Assistant Professors

Elizabeth C. Bartlet, Ph.D. (Chicago); Jan Herlinger, Ph.D. (Chicago)

The Department of Music offers work leading to the A.M. degree in composition and the A.M. and Ph.D. degrees in musicology. Applications are invited from students completing undergraduate curricula in music, as well as from qualified students in related disciplines. Nondegree students and especially graduate students from other departments may be admitted to graduate courses by consent of the instructor, according to their preparation. Students may be admitted to the Program in Medieval and Renaissance Studies (see the section on special programs in this bulletin).

A reading knowledge of one foreign language is required at admission; two are required for the A.M. (including German), and three for the Ph.D. (usually including German and Latin). Students are strongly urged to acquire as much language facility as possible before beginning graduate study.

A detailed description of the requirements for the A.M. and Ph.D. is available upon request from the Director of Graduate Studies. The student should refer also to the description of general requirements of the University found in the section on other requirements in this bulletin.

Courses of Instruction

- 201. Introduction to Musicology
- 211. Medieval Notation
- 212. Renaissance Notation
- 213. Theories and Notation of Contemporary Music
- 221. Music in the Middle Ages: Monophony
- 222. Music in the Middle Ages: Polyphony
- 223. Music in the Renaissance
- 224. Music in the Baroque Era
- 226. Music in the Romantic Era
- 290. Independent Study
- 296S. Analysis of Recent Contemporary Music
- 297, 298, 299. Composition
- 311S. Seminar in Medieval Music
- 314S. Seminar in the Classic Period

- 315S. Seminar in Nineteenth- and Twentieth-Century Music
- 331S. Music and Rhetoric (Sixteenth through Eighteenth Centuries)
- 341S. Problems in Music Theory
- 351S. Studies in Musical Iconography
- 382S. Studies in Ethnomusicology

Courses Currently Unscheduled

- 225. Music in the Classic Era
- 227. Music in the Postromantic and Modern Eras
- 312S. Seminar in Renaissance Music
- 313S. Seminar in Baroque Music
- 392S. Interdisciplinary Colloquium

Specific topics of the seminars will be announced at least one semester in advance. Among the offerings may be: *The Place of Music in Carolingian Culture*; *Theory and Practice of Musica Ficta*; *Monteverdi and His Time*; *Basso Ostinato* and Variation in the Baroque Era; The Masses of Haydn, Mozart, and Beethoven; Programmatic and Absolute Music in the Nineteenth Century; Elements of Musical Acculturation in Bali and Lombok (Indonesia); and French Organ Music.

The University Program in Neurobiology

Professor Irving Diamond, Ph.D. (Chicago), *Director*

Professors

Robert Erickson, Ph.D. (Brown); George G. Somjen, M.D. (Univ. of New Zealand); Thomas C. Vaman, Ph.D. (Duke)

Associate Professors

Doyle G. Graham, M.D., Ph.D. (Duke); William C. Hall, Ph.D. (Duke); Bernard Kaufman, Ph.D. (Indiana)

Assistant Professor

J. Victor Nadler, Ph.D. (Yale)

Recent advances in neurobiology have resulted in new methods, such as immunohistochemistry, and in closer ties among the various approaches to studying the nervous system. For example, research on the neuroanatomical basis of behavior is more dependent than ever before on the chemical and cellular study of neurons. To keep pace with these changes the program in neurobiology has been designed for a small number of students who wish to study the nervous system at several levels, ranging from the molecular to the behavioral. In planning course work, each student will be guided by an advisory committee whose members come from a variety of departments. All students will be advised to take courses in neuroanatomy, neurophysiology, neuropharmacology, and neuropsychology. The heart of the training is a research apprenticeship that leads to a Ph.D. dissertation. Each student must affiliate with one of the participating departments—anatomy, biochemistry, microbiology and immunology, pathology, pharmacology, physiology, psychology, and zoology—and must meet all the requirements of that department for the Ph.D. degree. Normally, the dissertation adviser and the student will be members of the same department. A complete list of faculty, including research interests, will be made available to prospective students. *See course listings under the participating departments.*

Pathology

Professor Robert B. Jennings, M.D. (Northwestern), *James B. Duke Professor of Pathology and Chairman*
Professor Darell D. Bigner, M.D., Ph.D. (Duke), *Director of Graduate Studies*

Professors

Dolph O. Adams, M.D., Ph.D. (North Carolina at Chapel Hill); Edward H. Bossen, M.D. (Duke); William D. Bradford, M.D. (Western Reserve); Bernard F. Fetter, M.D. (Duke); Donald B. Hackel, M.D. (Harvard); William W. Johnston, M.D. (Duke); Gordon K. Klintworth, M.D., Ph.D. (Univ. of Witwatersrand); John A. Koepke, M.D. (Wisconsin at Madison); Philip Pratt, M.D. (Johns Hopkins); Joachim R. Sommer, M.D. (Munich); F. Stephen Vogel, M.D. (Western Reserve); Benjamin Wittels, M.D. (Minnesota)

Associate Professors

Sandra H. Bigner, M.D. (Tennessee); Peter C. Burger, M.D. (Northwestern); Jane G. Elchlepp, M.D. (Iowa), Ph.D. (Chicago); Doyle G. Graham, M.D., Ph.D. (Duke); Kenneth Scott McCarty, Jr., M.D., Ph.D. (Duke); George Michalopoulos, M.D., Ph.D. (Wisconsin); Salvatore V. Pizzo, M.D., Ph.D. (Duke); Keith Arnold Reimer, M.D., Ph.D. (Northwestern); John D. Shelburne, M.D., Ph.D. (Duke); Peter Zwadyk, Jr., Ph.D. (Iowa)

Assistant Professors

Randy L. Jirtle, Ph.D. (Wisconsin); Alfred P. Sanfilippo, M.D., Ph.D. (Duke); Stanley C. Schold, Jr., M.D. (Arizona)

Adjunct Associate Professor

James A. Swenberg, D.V.M. (Minnesota), Ph.D. (Ohio State)

Adjunct Assistant Professor

Arnold R. Brody, Ph.D. (Colorado State)

Assistant Clinical Professor

Robin T. Vollmer, M.D. (Duke)

Assistant Medical Research Professor

Carol J. Wikstrand, Ph.D. (North Carolina at Chapel Hill)

The Department of Pathology offers graduate work leading to the M.S. and Ph.D. degrees with areas of specialization such as subcellular and molecular pathology. Course work is designed to give a broad background in classical and modern pathology with emphasis on the application of modern research techniques. Students will be required to take such courses as are necessary to obtain a broad foundation, as well as courses applicable to areas of speciality and research. Further information including brochures giving details of departmental facilities, staff, trainee stipends, and the M.D.-Ph.D. program are available from the Director of Graduate Studies.

Courses of Instruction

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|--|---|
| 219. Molecular and Cellular Bases of Differentiation | 369. Ophthalmic Pathology |
| 250. General Pathology | 370. Developmental Pathology and Teratology |
| 251. Laboratory Course in General Pathology | 374. Pulmonary Pathology and Postmortem Pathophysiology |
| 258. Cellular and Subcellular Pathology | 377. Pathology of the Kidney |
| 275. Fundamentals of Electron Microscopy | 380. Diagnostic Immunology |
| 325. Cardiovascular Pathology | 381. Cancer Biology |
| 353. Advanced Neuropathology | 382. General Pathology for Toxicologists |
| 355. Graduate Seminar in Pathology | 394. Immunobiology of the Macrophage |
| 357. Research in Pathology | |
| 361, 362. Autopsy Pathology | Courses Currently Unscheduled |
| 364. Systemic Pathology | 360. Cytochemistry |
| 367. Special Topics in Pathology | |

Pharmacology

Professor Norman Kirshner, Ph.D. (Pennsylvania State), *Chairman*
Professor Elliott Mills, Ph.D. (Columbia), *Director of Graduate Studies*

Professors

Everett H. Ellinwood, Jr., M.D. (North Carolina at Chapel Hill); Leon Lack, Ph.D. (Columbia); Daniel B. Menzel, Ph.D. (California at Berkeley); Athos Ottolenghi, M.D. (Univ. of Pavia); Saul M. Schanberg, M.D., Ph.D. (Yale); David G. Shand, M.B., Ph.D. (St. Bartholomew's Hosp. Med. Coll.); Theodore A. Slotkin, Ph.D. (Rochester); Pelham Wilder, Jr., Ph.D. (Harvard)

Associate Professors

Mohamed Bahie Abou-Donia, Ph.D. (California at Berkeley); P Michael Conn, Ph.D. (Baylor); James N. Davis, M.D. (Cornell); Laura T. Gutman, M.D. (Stanford); Gerald M. Rosen, Ph.D. (Clarkson Coll. of Tech.); Harold C. Strauss, M.D. (McGill)

Assistant Professors

Thorir D. Bjornsson, M.D. (Univ. of Iceland); James C. Fuchs, M.D. (Johns Hopkins), *Burroughs Wellcome Assistant Professor of Clinical Pharmacology*; Cynthia Moreton Kuhn, Ph.D. (Duke); James O. McNamara, M.D. (Michigan); J. Victor Nadler, Ph.D. (Yale); A. Richard Whorton, Ph.D. (Vanderbilt)

Professor Emeritus

F Bernheim, Ph.D. (Univ. of Cambridge), *James B. Duke Professor Emeritus of Pharmacology*

Adjunct Professors

Pedro Cuatrecasas, M.D. (Washington Univ., St. Louis); Charles A. Nichol, Ph.D. (Wisconsin)

Adjunct Associate Professor

Osvaldo Humberto Viveros, M.D. (Univ. of Chile)

Associate Medical Research Professor

Wilkie A. Wilson, Jr., Ph.D. (Duke)

Assistant Medical Research Professors

Jorge V. Bartolome, Ph.D. (Chile); Brij B. Shrivastav, Ph.D. (Western Ontario); Peter G. Smith, Ph.D. (Duke); Steven P. Wilson, Ph.D. (Duke)

The Department of Pharmacology offers graduate work leading to the Ph.D. degree. The department considers a strong background in basic science as necessary, serious consideration being given to candidates with majors in biology, chemistry, mathematics, and physics. There is no foreign language requirement.

Courses of Instruction

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|---|---|
| 210, 211. Individual Study and Research | 331. Laboratory Methods in Pharmacology |
| 219. Tutorial in Pharmacology | 333. Principles of Pharmacology and Toxicology I |
| 250. Pharmacology: Mode Action of Drugs | 334. Principles of Pharmacology and Toxicology II |
| 256. Human Nutrition | 335. Cellular Pharmacology |
| 260S. Interactions of Differentiated Cells | 347, 348. Seminar in Toxicology |
| 270. Neurobiology I | 354. Mammalian Toxicology |
| 280. Student Seminar in Pharmacology | 360. Neuropharmacology |
| 301. Physical Chemistry of Aqueous Solutions | 364. Neurotoxicology |
| 302. Statistical Methods in Pharmacology and Toxicology | 372. Research in Pharmacology |
| 330. Pharmacological Basis of Clinical Medicine | 417. Cellular Endocrinology |

Philosophy

Professor Martin P. Golding, Ph.D. (Columbia), *Chairman*

Professor William Bernard Peach, Ph.D. (Harvard), *Director of Graduate Studies*

Professors

Edward P. Mahoney, Ph.D. (Columbia); David H. Sanford, Ph.D. (Cornell)

Associate Professors

Carl J. Posy, Ph.D. (Yale); George W. Roberts, Ph.D. (Cambridge)

Assistant Professors

Robert N. Brandon, Ph.D. (Harvard), *Andrew W. Mellon Assistant Professor of Philosophy*; Kathryn N. Jackson, Ph.D. (Toronto); Thomas E. Wartenberg, Ph.D. (Pittsburgh)

The Department of Philosophy offers graduate work leading to the A.M. and Ph.D. degrees. Tutorial work complements formal instruction. Students may specialize in any of the following fields: the history of philosophy, logic, philosophy of science, epistemology, metaphysics, philosophy of mind, philosophical analysis, ethics, aesthetics, political philosophy, philosophy of law, philosophy of medicine, and philosophy of religion.

Individual programs of study are developed for each student. The following requirement, however, is fundamental: the preliminary examination for the Ph.D., which may be taken only after a student has met the language requirement for that degree, should be taken after the second year of study. In these examinations students are expected to combine historical knowledge with critical understanding.

Work in a minor or related field, not necessarily confined to any one department, is encouraged but not required. A minor normally includes 6 units for the A.M. or the Ph.D. degree and may include more as a student's program requires or permits.

A student who meets the general requirements of the Graduate School may earn the A.M. degree in philosophy by passing an oral master's examination. This examination, which can be the defense of either a master's thesis or an alternative academic exercise approved by the department and the student's committee, is normally given

in the student's fourth term of full-time registration. The examination can be given earlier in two special circumstances:

1. A student with a strong undergraduate background in philosophy who satisfies the department of his or her qualifications by submitting several samples of written work before beginning the program may be admitted to the master's program with the understanding that the master's examination can be given in the second or third term of full-time registration.

2. A student who combines the A.M. program in philosophy with another advanced degree program, such as the programs for the J.D., the M.D., or the Ph.D. in another field, will register as a full-time graduate student of philosophy for only two terms, the minimum registration that meets the general requirements of the Graduate School for the A.M. degree. These two terms of full-time registration need not be consecutive, and their position in the student's overall program is determined in individual cases. A student in a combined program will normally do some work in philosophy while registered in the student's primary program and do some work in the primary field while registered in philosophy. The master's examination can be given in the second term of full-time registration as a philosophy graduate student or in a later term when the student is registered in the primary program.

A student in the philosophy Ph.D. program who meets the general requirements of the Graduate School for the A.M. degree may earn this degree by passing the preliminary for the Ph.D. degree.

A reading knowledge of at least one foreign language, ancient or modern, is required for the Ph.D. degree. Students may not take their preliminary examinations until they have demonstrated this ability. More than one language may be required where this is judged appropriate to the research demanded by the candidate's dissertation.

Courses of Instruction

- 203S. Contemporary Ethical Theories
- 204S. Philosophy of Law
- 206S. Responsibility
- 208S. Political Values
- 211S. Plato
- 217S. Aristotle
- 218S. Medieval Philosophy
- 219S. Late Medieval and Renaissance Philosophy
- 225S. British Empiricism
- 227S. Continental Rationalism
- 228S. Recent and Contemporary Philosophy
- 230S. The Meaning of Religious Language
- 231S. Kant's Critique of Pure Reason
- 233S. Methodology of the Empirical Sciences

- 234S. Problems in the Philosophy of Science
- 235S. Hegel and Marx
- 251S. Epistemology
- 252S. Metaphysics
- 253S. Philosophy of Mind
- 254S. Philosophy of Religion

Courses Currently Unscheduled

- 202S. Aesthetics: The Philosophy of Art
- 205S. Philosophy of History
- 232S. Recent Continental Philosophy
- 291S, 292S. Seminar in Special Fields of Philosophy
- 311. Philosophy and Medicine
- 331, 332. Seminar in Special Fields of Philosophy

Physical Therapy

Professor Robert C. Bartlett, M.A. (New York Univ.), *Chairman*
Associate Professor Eleanor F. Branch, Ph.D. (Duke), *Director of Graduate Studies*

Associate Professor

Elia E. Villanueva, A.M. (Duke)

Assistant Professors

Pamela W. Duncan, M.A.C.T. (North Carolina at Chapel Hill); Grace C. Horton, M.S. (Duke); Steven G. Nelson, Ph.D. (Duke)

Assistant Clinical Professors

Elaine M. Eckel, M.A. (North Carolina at Chapel Hill); Mary Ellen Riordan, M.S. (Wisconsin)

The Department of Physical Therapy offers an entry level professional program leading to the M.S. degree. To be eligible for admission to the program, applicants must have obtained a baccalaureate degree and have a background in the basic sciences and social sciences, including course work in biology, chemistry, physics, and psychology.

The program is designed to provide for integration of classroom knowledge and clinical learning experiences essential for the competent practice of physical therapy. In view of this integrated curriculum, failure in a major course within a semester would prevent the student from continuing in the program. Major courses are all courses offered by the Department of Physical Therapy as well as required courses offered by the Department of Anatomy. A grade of *F* (or *noncredit* in the case of Physical Therapy 342, 343, and 344) in any of these courses will occasion withdrawal from the program. Program requirements also include a comprehensive examination, at the completion of the curriculum, and a research project. Further information may be obtained from the Director of Graduate Studies, Department of Physical Therapy, Box 3965, Duke University Medical Center, Durham, North Carolina 27710.

Courses of Instruction

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|--|---|
| 210. Independent Study | 324. Prosthetics and Orthotics |
| 301. Introduction to Scientific Inquiry | 332. Physical Therapy and Health Services:
Administration and Issues |
| 302. Research | 334. Introductory Pathology |
| 303. Research | 336. Medical Sciences |
| 304. Seminar in Applied Neurophysiology | 340. Special Topics in Physical Therapy |
| 313, 314. Physical Agents | 342. Directed Clinical Experience in Physical
Therapy I |
| 317. Kinesiology | 343. Directed Clinical Experience in Physical
Therapy II |
| 318. Arthrology and Pathokinesiology | 344. Directed Clinical Experience in Physical
Therapy III |
| 319. Introduction to Evaluation and Patient Care | |
| 320. Evaluation and Therapeutic Procedures I | |
| 321. Evaluation and Therapeutic Procedures II | |
| 322. Evaluation and Therapeutic Procedures III | |

Physics

Professor Harold W. Lewis, Ph.D. (Duke), *University Distinguished Service Professor of Physics and Chairman*
 Professor Henry A. Fairbank, Ph.D., (Yale), *Director of Graduate Studies*

Professors

L. C. Biedenharn, Jr., Ph.D. (Massachusetts Inst. of Tech.); Edward G. Bilpuch, Ph.D. (North Carolina at Chapel Hill); Ron Y. Cusson, Ph.D. (California Inst. of Tech.); Lawrence E. Evans, Ph.D. (Johns Hopkins); Moo-Young Han, Ph.D. (Rochester); Johannes Horst Max Meyer, Ph.D. (Univ. of Geneva); N. Russell Roberson, Ph.D. (Johns Hopkins); Hugh G. Robinson, Ph.D. (Duke); William D. Walker, Ph.D., (Cornell); Richard L. Walter, Ph.D. (Notre Dame); Henry R. Weller, Ph.D. (Duke)

Associate Professors

Frank C. De Lucia, Ph.D. (Duke); Lloyd R. Fortney, Ph.D. (Wisconsin); Alfred T. Goshaw, Ph.D. (Wisconsin); Eric Herbst, Ph.D. (Harvard)

Assistant Professors

Robert P. Behringer, Ph.D. (Duke); Peter W. Lucas, Ph.D. (Yale); Richard G. Palmer, Ph.D. (Cambridge)

Adjunct Professors

Fearghus O'Foghludha, Ph.D. (National Univ. of Ireland); Herman R. Robl, Ph.D. (Univ. of Vienna); Katherine Way, Ph.D. (North Carolina at Chapel Hill)

The Department of Physics offers graduate work for students wishing to earn the A.M. or Ph.D. degree. In addition to a balanced program of basic graduate courses, the department offers specialized courses and seminars in several fields in which research is being done by faculty and staff.

With the help of faculty advisers, students select a course program to fit their needs, including work in a related field, usually mathematics or chemistry. Students are encouraged to begin research work early in their careers.

Courses of Instruction

- 211, 212. Modern Physics
- 214. Introduction to Solid-State Physics
- 215. Introduction to Quantum Mechanics
- 217S, 218S. Advanced Physics Laboratory and Seminar
- 220. Electronics
- 240. Computer Application to Physical Measurement
- 302. Advanced Mechanics
- 303. Statistical Mechanics
- 305. Introduction to Nuclear Physics
- 308. Introduction to High-Energy Physics
- 309. Solid-State Physics I
- 310. Solid-State Physics II*
- 316. Principles of Quantum Theory
- 317. Intermediate Quantum Theory
- 318. Electromagnetic Field Theory
- 331. Quantum Electronics*

- 341. Advanced Topics in Quantum Theory*
- 346. Topics in Theoretical Physics*

Courses Currently Unscheduled

- 255. Astronomy for Teachers
- 304. Advanced Topics in Statistical Mechanics
- 306. Low Temperature Physics
- 312. Phase Transitions and Critical Phenomena
- 330. Nuclear Structure Theory
- 333. Molecular Reaction Dynamics
- 335. Molecular Spectroscopy
- 342. Theory of Elementary Particles
- 343. Nuclear Physics
- 344. Advanced Nuclear Physics
- 345. High-Energy Physics
- 351, 352. Seminar
- 397, 398. Low Temperature and Solid-State Seminar

Physiology

Professor Edward A. Johnson, M.D. (Univ. of Sheffield), *James B. Duke Professor of Physiology and Chairman*
Associate Professor Thomas J. McManus, M.D. (Boston), *Director of Graduate Studies*

Professors

J. J. Blum, Ph.D. (Chicago), *James B. Duke Professor of Physiology*; Irving T. Diamond, Ph.D. (Chicago); John W. Gutknecht, Ph.D. (North Carolina at Chapel Hill); Frans F. Jöbsis, Ph.D. (Michigan); Peter K. Lauf, M.D. (Univ. of Freiburg); Melvyn Lieberman, Ph.D. (SUNY, Downstate Med. Center); John W. Moore, Ph.D. (Virginia); Jacqueline A. Reynolds, Ph.D. (Washington); John V. Salzano, Ph.D. (Iowa); Knut Schmidt-Nielsen, Ph.D. (Univ. of Copenhagen); George G. Somjen, M.D. (Univ. of New Zealand); Madison S. Spach, M.D. (Duke); Charles Tanford, Ph.D. (Princeton), *James B. Duke Professor of Physiology*; Andrew G. Wallace, M.D. (Duke)

Associate Professors

Nels C. Anderson, Ph.D. (Purdue); Peter B. Bennett, Ph.D. (Univ. of Southampton); Robert P. Erickson, Ph.D. (Brown); Joseph C. Greenfield, M.D. (Emory); Johannes A. Kylstra, M.D., Ph.D. (Univ. of Leiden); Harold E. Lebovitz, M.D. (Pittsburgh); Lazaro J. Mandel, Ph.D. (Pennsylvania); Elliott Mills, Ph.D. (Columbia); George M. Padilla, Ph.D. (California at Los Angeles); David W. Schomberg, Ph.D. (Purdue); Sidney A. Simon, Ph.D. (Northwestern); Myron L. Wolbarsht, Ph.D. (Johns Hopkins)

Assistant Professors

Page A. W. Anderson, M.D. (Duke); Enrico Mario Camporesi, M.D. (Univ. of Milan); Vincent W. Dennis, M.D. (Georgetown); Stuart Handwerger, M.D. (Maryland); Rayford S. Jones, M.D. (Texas); Andrew S. Wechsler, M.D. (SUNY, Downstate Med. Ctr.); William E. Yarger, M.D. (Baylor)

Adjunct Associate Professor

C. Russell Horres, Jr., Ph.D. (Duke)

Adjunct Assistant Professors

Reginald D. Carter, Ph.D. (Bowman Gray); Philip A. McHale, Ph.D. (Duke)

*Offered on demand.

Associate Medical Research Professor

J. Mailen Kootsey, Ph.D. (Brown)

Assistant Medical Research Professors

Gilbert Baumann, Dr.Sc. (Swiss Federal Inst. of Tech.); Hie Ping Beall, Ph.D. (Tulane); Michael Lee Hines, Ph.D. (Chicago); Avis L. Sylvia, Ph.D. (North Carolina at Chapel Hill)

The Department of Physiology offers graduate work leading to the Ph.D. degree. Before undertaking this program a student should have a strong background in basic sciences including course work in mathematics, biology, physics, and chemistry through physical chemistry. Undergraduates with this background may have majors in any of the following areas: biology, chemistry, physics, mathematics, engineering, or computer sciences. There is no foreign language requirement.

Courses of Instruction

200. Introduction to Physiology
203. Introduction to Biophysics and Biophysical Chemistry
204. Introduction to Modern Physiology
207. The Heart in Health and Disease
208. Respiratory System in Health and Disease
210. Individual Study
217. Membrane Transport
219S. Seminar in Membrane Physiology
230. Molecular and Cellular Bases of Differentiation
260S. Interactions of Differentiated Cells
270. Neurobiology I
272S. Physiology of the Central Nervous System
280. Student Seminar in Physiology
281. Teaching in Physiology
302. Advanced Topics and Research Seminar in Smooth and Striated Muscle

320. Gastrointestinal Physiology
321. Renal Physiology
372. Research in Physiology
383. Physiological Instrumentation
390. Membrane Biology
401. Metabolic Physiology
416. Biophysics of Excitable Membranes
417. Cellular Endocrinology
418. Reproductive Biology
424. Seminar in Reproductive Biology

Courses Currently Unscheduled

301. Oxygen and Physiological Function
362. Cardiac Muscle Physiology
419. Topics in Mathematical Physiology
420. Cellular Immunophysiology

Political Science

Professor Ole R. Holsti, Ph.D. (Stanford), *George V. Allen Professor of Political Science and Chairman*
Professor David E. Price, B.D., Ph.D. (Yale), *Director of Graduate Studies*

Professors

James D. Barber, Ph.D. (Yale), *James B. Duke Professor of Political Science*; Ralph Braibanti, Ph.D. (Syracuse), *James B. Duke Professor of Political Science*; Frederic N. Cleaveland, Ph.D. (Princeton); Peter G. Fish, Ph.D. (Johns Hopkins); Hugh M. Hall, Jr., Ph.D. (Texas); Donald L. Horowitz, LL.M., Ph.D. (Harvard); Jerry F. Hough, Ph.D. (Harvard); Allan Kornberg, Ph.D. (Michigan); Richard H. Leach, Ph.D. (Princeton); David L. Paletz, Ph.D. (California at Los Angeles); Thomas A. Spragens, Jr., Ph.D. (Duke)

Associate Professors

Albert Eldridge, Ph.D. (Kentucky); Sheridan Johns III, Ph.D. (Harvard); Peter Lange, Ph.D. (Massachusetts Inst. of Tech.); Margaret A. McKean, Ph.D. (California at Berkeley); Arturo Valenzuela, Ph.D. (Columbia)

Assistant Professors

Robert M. Entman, Ph.D. (Yale); David J. Falcone, M.H.A., Ph.D. (Duke); Joseph M. Grieco, Ph.D. (Cornell); John F. Hoadley, Ph.D. (North Carolina at Chapel Hill); Joseph J. Kruzel, Ph.D. (Harvard)

Part-Time Associate Professor

Jean F. O'Barr, Ph.D. (Northwestern)

The Department of Political Science offers graduate work leading to the A.M. and Ph.D. degrees. Before being admitted to candidacy for the Ph.D. degree, an applicant must have qualified for the A.M. degree.

Instruction is designed to prepare the student for teaching and research, for government service, and for other work related to public affairs. Before undertaking grad-

uate study in political science, a student is ordinarily expected to have completed at least 12 semester hours of course work in political science. Instruction is currently offered in the following fields: American government and politics, comparative government and politics, political theory, and international relations.

The candidate for the degree of Doctor of Philosophy in political science must take at least sixteen courses in all, including twelve in the department, and demonstrate competence in at least two general fields of the discipline as well as in a third general field or in a specialized subfield or in a field external to the department. The candidate must also demonstrate a reading knowledge of two foreign languages or must demonstrate proficiency in one foreign language and in the use of statistics.

The terminal degree of Master of Arts, for those who do not intend to continue with doctoral studies, is awarded following successful completion of: (1) eight one-semester courses of 3 units each, at least half of which must be in political science; and (2) the A.M. thesis. In addition, candidates for the A.M. degree must demonstrate competence in one foreign language or in statistics.

Further details on the graduate program in political science, the departmental facilities, the staff, and available financial aid may be obtained from the Director of Graduate Studies, Department of Political Science.

Courses of Instruction

- 201S. Problems in International Security
- 203. Politics and the Media of Mass Communication
- 204S. Ethics in Political Life
- 205S. Science, Politics, and Government
- 207. American Constitutional Interpretation
- 208S. Analyzing the News
- 209. Problems in State Government and Politics
- 211S. Current Problems and Issues in Japanese Politics
- 213S. Theories of International Political Economy
- 214S. The Politics of Scarcity
- 218S, 219S. Political Thought in the United States
- 220S. Problems in International Politics
- 223. Political Philosophy from Plato to Machiavelli
- 224. Modern Political Theory
- 225. Comparative Government and Politics: Western Europe
- 226S. Theories of International Relations
- 227. International Law
- 228S. Nineteenth- and Twentieth-Century Continental Political Philosophy
- 229. Recent and Contemporary Political Theory
- 233S. Quantitative Political Analysis II
- 234S. Political Economy of Development: Theories of Change in the Third World
- 235S. Comparative Development of Islam
- 236. Statistical Analysis
- 242S. Comparative Law and Policy: Ethnic Group Relations
- 245. Ethics and Policy Making
- 248. The Politics of the Policy Process
- 249. Comparative International Development and Technology Flow

- 253. Comparative Government and the Study of Latin America
- 260. The Tradition of Political Inquiry
- 262S. International Communism
- 275. The American Party System
- 277. Comparative Party Politics
- 280S. Comparative Government and Politics: Sub-Saharan Africa
- 282S. Canada
- 283S. Congressional Policy Making
- 286S. Judicial Administration
- 293. Federalism
- 302. Departmental Research Seminar
- 303. Seminar on Statistics
- 308. Individual Research
- 309. Seminar in International Relations
- 321. Seminar in Political Theory
- 325. Seminar in Comparative Government and Politics
- 340. Seminar in American Politics and Institutions
- 381. Research Seminar in Latin-American Government and Politics

Courses Currently Unscheduled

- 217S. Economic Theories of Political Behavior
- 239S. Current Problems of International Law
- 244S. Administrative Law and Process
- 246. Administration and Public Policy
- 285. The Judicial Process
- 360. Seminar in Government and Politics in the Soviet Union

Related Course Work in the School of Law

There may be graduate credit for course work completed in the Duke University School of Law, under regulations referred to in the larger Graduate School bulletin (see the section on academic regulations in the chapter "Registration and Regulations" in that bulletin).

Psychology

Professor Robert C. Carson, Ph.D. (Northwestern), *Chairman*

Associate Professor Carol O. Eckerman, Ph.D. (Columbia), *Director of Graduate Studies*

Professors

Irving E. Alexander, Ph.D. (Princeton); William Bevan, Ph.D. (Duke), *William Preston Few Professor of Psychology*; Lloyd J. Borstelmann, Ph.D. (California at Berkeley); Philip R. Costanzo, Ph.D. (Florida); Irving T. Diamond, Ph.D. (Chicago), *James B. Duke Professor of Psychology*; Carl J. Erickson, Ph.D. (Rutgers); Robert P. Erickson, Ph.D. (Brown); Norman Guttman, Ph.D. (Indiana); Gregory A. Kimble, Ph.D. (Iowa); Martin Lakin, Ph.D. (Chicago); Gregory R. Lockhead, Ph.D. (Johns Hopkins); Harold Schiffman, Ph.D. (Princeton); John E. R. Staddon, Ph.D. (Harvard); Michael A. Wallach, Ph.D. (Harvard); Cliff W. Wing, Jr., Ph.D. (Tulane)

Associate Professors

John H. Casseday, Ph.D. (Indiana); John D. Coie, Ph.D. (California at Berkeley); Ruth S. Day, Ph.D. (Stanford); Warren G. Hall, Ph.D. (Johns Hopkins); William C. Hall, Ph.D. (Duke); John B. McConahay, Ph.D. (California at Los Angeles); Susan Roth, Ph.D. (Northwestern); David C. Rubin, Ph.D. (Harvard)

Assistant Professors

Clifford A. Butzin, Ph.D. (California at San Diego); Irwin Kremen, Ph.D. (Harvard)

Adjunct Professors

H. Keith H. Brodie, M.D. (Columbia); David P. Campbell, Ph.D. (Minnesota); Herbert F. Crovitz, Ph.D. (Duke)

Lecturers

Kenneth E. Clark, Ph.D. (Ohio State); Charles N. Cofer, Ph.D. (Brown); Ralph L. Cooper, Ph.D. (Rutgers); Steven H. Herman, Ph.D. (Duke); Francis J. Keefe, Ph.D. (Ohio Univ.); Andrew P. King, Ph.D. (Cornell); Patrick E. Logue, Ph.D. (North Dakota); Gail R. Marsh, Ph.D. (Iowa); Ellis B. Page, Ed.D. (California at Los Angeles); John W. Payne, Ph.D. (California at Irvine); Rolffs S. Pinkerton, Ph.D. (Georgia); M. Henry Pitts, Ph.D. (Chicago); Robert N. Sawyer, Ed.D. (Wyoming); Susan S. Schiffman, Ph.D. (Duke); Robert H. Shipley, Ph.D. (Michigan State); George G. Somjen, M.D. (New Zealand); Richard S. Surwit, Ph.D. (McGill); Robert J. Thompson, Jr., Ph.D. (North Dakota); Lise Wallach, Ph.D. (Kansas); Redford B. Williams, Jr., M.D. (Yale); Myron L. Wolbarsht, Ph.D. (Johns Hopkins)

The department offers work leading to the Ph.D. degree. The areas of concentration are experimental, biological, cognitive, personality, developmental, and clinical. A brochure is available from the Director of Graduate Studies which describes the program in more detail and gives information on financial assistance, facilities, and current research activities.

Courses of Instruction

202S. Great Ideas in Psychology
203S. Sensation and Perception
210S. Cognitive Psychology
212S. Human Memory
214S. Development of Social Interaction
215S. Cognitive Development
216S. Biological Psychology
217S. Social Psychology
219S. Neural Bases of Behavior
230S. Social Behavior of Animals
234S. Personality
238S. Electroencephalogram and Psychological Function
245S. Personality Theory
260S. Science, Technology, and Society
261S. Science, Politics, and Government

271. A-F Selected Problems
272S. Physiology of the Central Nervous System
273S, 274S. Statistical Principles in Experimental Design
283S, 284S. The History of Psychology
286S. Psychophysiology of Hearing
295S. Group Psychotherapy and Processes
305. Psychopathology
307. Introduction to Methods in Psychotherapy
309. Seminar in Learning
310. Seminar in Perception
318. Methods of Inquiry
319-320. Research Apprenticeship I
323, 324. Seminar in Community Psychology
331-332. Research Apprenticeship II
335-336. Clinical Inquiry I

- 337. Seminar in Sensory Discrimination
- 343-344. Clinical Inquiry II
- 345, 346. Clinical Methods with Children and
Clinical Methods with Adolescents
- 348. Psychotherapy with Children and Families
- 349-350. Practicum in Psychological Research
- 398. Graded Research
- 399. Special Readings in Psychology

Courses Currently Unscheduled

- 253S. Psychological Approaches to Public Policy
Analysis
- 325. Seminar in Animal Behavior
- 329-330. Proseminar in Psychology
- 334. Seminar: Behavioral Studies of the Brain
- 338. Pictorial Representation and Iconic
Communication

Public Policy Studies

Associate Professor Robert D. Behn, Ph.D. (Harvard), *Director*
 Associate Professor Philip J. Cook, Ph.D. (California at Berkeley), *Associate Director*
 Assistant Professor Barbara Devaney, Ph.D. (Michigan), *Director of Graduate Studies*
 Bonnie Bain, *Director of Internship Programs and Placement Services*

Professors

James D. Barber, Ph.D. (Yale); Colin C. Blaydon, Ph.D. (Harvard); David M. Eddy, M.D. (Virginia),
 Ph.D. (Stanford); Joel L. Fleishman, LL.M. (Yale); Donald L. Horowitz, LL.M., Ph.D. (Harvard); Jerry
 F. Hough, Ph.D. (Harvard); David L. Lange, LL.B. (Illinois); George W. Pearsall, Sc.D. (Massachusetts
 Inst. of Tech.); David E. Price, Ph.D. (Yale); W. Kip Viscusi, Ph.D. (Harvard)

Associate Professors

Charles T. Clotfelter, Ph.D. (Harvard); Joseph Lipscomb, Jr., Ph.D. (Vanderbilt); Wesley A. Magat,
 Ph.D. (Northwestern); John B. McConahay, Ph.D. (California at Los Angeles); Carol B. Stack, Ph.D.
 (Illinois); James W. Vaupel, Ph.D. (Harvard)

Assistant Professors

Robert M. Entman, Ph.D. (Yale); Catherine Hawes, Ph.D. (Texas); Bruce R. Kuniholm, Ph.D. (Duke);
 Michael I. Luger, Ph.D. (California at Berkeley)

Professors of the Practice

Henry Geller, J.D. (Northwestern); Duncan Yaggy, Ph.D. (Brandeis)

Lecturer

Bruce L. Payne, M.A. (Yale)

The graduate program in public policy studies is offered through the Institute of Policy Sciences and Public Affairs. The objective of the program is to prepare students for public sector jobs which require analytical skills and a practical understanding of the processes by which policy is made and implemented.

The A.M. degree requires two academic years and a summer internship. The first year is devoted to core courses in policy analysis, including sequences in quantitative methods, economics, political analysis, and ethics. The summer internship is arranged with a federal or state agency. The second-year curriculum includes course work in public management, a concentration in a substantive policy area, and a masters "memo" to be researched and written on a problem of current policy concern.

Students who are concurrently enrolled in a Ph.D. program or a professional degree program (M.D., J.D., M.B.A., M.H.A., etc.) or who have already obtained such a degree, can apply for an abbreviated version of the A.M. program. Such students are excused from all the requirements of the second year except for the masters memo, so ordinarily completing the A.M. requirements adds only one year to their graduate programs. Students usually apply for a joint degree program simultaneously with their applications to the graduate departments or professional schools, or during their first or second year of advanced study.

The institute does not award a Ph.D.

More information concerning the A.M. programs can be obtained by writing the Director of Graduate Studies.

Courses of Instruction

- 204S. Ethics in Political Life
- 207S. Mass Media, Public Opinion, and Public Policy
- 215S. Public Policies to Save Lives
- 217. Microeconomics and Public Policy Making
- 218. Macroeconomic Policy
- 219. The Politics of the Policy Process
- 221. Analytical Methods I: Decision Analysis for Public Policy Makers
- 222. Analytical Methods II: Data Analysis for Public Policy Makers
- 223. Ethics and Policy Making
- 231. Analytical Methods III: Quantitative Policy Evaluation
- 232. Analytical Methods IV: Topics in Economic Policy
- 236S, 237S. Public Budgeting and Management I and II
- 240S. Analyzing the News
- 241. Reporting the American People
- 242S. Comparative Law and Policy: Ethnic Group Relations
- 250. Public Policy and the Arts
- 255S. Science, Politics, and Government
- 257. United States Policy in the Middle East
- 264S. Research Seminar: Topics in Public Policy I

- 268. Federal Tax Policy
- 270S. Humanistic Perspectives on Public Policy
- 272. Resource Economics and Policy
- 283S. Congressional Policy Making
- 303. Public Policy Workshop I
- 304.01. Public Policy Workshop II
- 305.01. Public Policy Workshop III
- 387. Research Tutorial in Public Policy
- 388. Research Tutorial in Public Policy
- 399. Special Readings in Public Policy Studies

Courses Currently Unscheduled

- 206S. Contemporary Social Journalism
- 224. Applications of Administrative and Organizational Theory
- 252S. National Security Policy
- 253S. Psychological Approaches to Public Policy
- 254. Transportation Planning and Policy Analysis
- 256. The Economics of Health Care
- 260S. Research Seminar: The Administration of Justice
- 261S. Research Seminar: Health Policy
- 262S. Communication Policy and the Law
- 266. The Politics of Health Finance and Regulation
- 273S. The Uses of History in Public Policy II
- 276S. National Policies and the Family

Religion

Associate Professor Kalman P. Bland, Ph.D. (Brandeis), *Chairman*

Professor Eric M. Meyers, Ph.D. (Harvard), *Director of Graduate Studies*

Professors

William W. Beach, Ph.D. (Yale); David G. Bradley, Ph.D. (Yale); Elizabeth A. Clark, Ph.D. (Columbia); Stuart C. Henry, Ph.D. (Duke); Frederick Herzog, Th.D. (Princeton); Wesley A. Kort, Ph.D. (Chicago); Creighton Lacy, Ph.D. (Yale); Thomas A. Langford, Ph.D. (Duke); Bruce B. Lawrence, Ph.D. (Yale); C. Eric Lincoln, Ph.D. (Boston); Charles H. Long, Ph.D. (Chicago); Roland E. Murphy, S.T.D. (Catholic Univ. of America); Robert T. Osborn, Ph.D. (Drew); William H. Poteat, Ph.D. (Duke); James L. Price, Jr., Ph.D. (Univ. of Cambridge); D. Moody Smith, Ph.D. (Yale); Harmon L. Smith, Ph.D. (Duke); David C. Steinmetz, Th.D. (Harvard); Orval S. Wintermute, Ph.D. (Johns Hopkins); Franklin W. Young, Ph.D. (Duke), *Amos Ragan Kearns Professor of New Testament and Patristic Studies*

Associate Professors

Lloyd R. Bailey, Ph.D. (Hebrew Union Coll., Jerusalem); James H. Charlesworth, Ph.D. (Duke); Roger J. Corless, Ph.D. (Wisconsin); Robert C. Gregg, Ph.D. (Pennsylvania); Harry B. Partin, Ph.D. (Chicago)

Assistant Professor

Carol L. Meyers, Ph.D. (Brandeis)

Research Professor Emeritus

Robert E. Cushman, Ph.D. (Yale)

The Department of Religion offers graduate work leading to the A.M. and Ph.D. degrees. Students may major in one of seven fields: (1) Old Testament and Semitic studies, (2) New Testament and Christian origins, (3) history of Christianity, (4) Christian theology and ethics, (5) history of Judaism, (6) history of religions, and (7) religion and culture. They will be expected to take courses which will contribute to an adequate understanding of their chosen fields of specialization and will be required to take two written preliminary examinations within their field of concentration.

In addition to course work in their major field, students will take such other courses in cognate fields as will contribute to the enrichment of their major studies and will be required to take one written preliminary examination in a single cognate area within the department. A minor requirement may be fulfilled by work in a cognate department, such as classical studies, history, philosophy, political science, or sociology, and will constitute the outside minor and material for a fourth written preliminary examination. There is, in addition, an oral examination conducted by the student's committee immediately subsequent to the written examinations.

The program of doctoral studies presumes a foundation in the academic study of religion. Students applying for graduate work in religion directly from an undergraduate program should have had a strong undergraduate major in religion, and will be accepted for the Ph.D. program only upon the satisfactory completion of the A.M. degree with the department.

The graduate program also offers an A.M. degree that is not linked to a specific Ph.D. field. Such study is intended to encourage individuals to pursue a variety of interests irrespective of whether they desire further graduate study. An A.M. concentration may be in any of the seven Ph.D. fields or in an individually designed program of study (such as Islamic studies or religion and the social sciences).

Courses of Instruction

207. 208. Intermediate Biblical Hebrew
209. Old Testament Theology
210. Contemporary British Theology
217. Islam in India
218. Religion in Japan
219. Augustine
220. Rabbinic Hebrew
221. Readings in Hebrew Biblical Commentaries
- 223A-E. Exegesis of the Hebrew Old Testament
225. Living Issues in New Testament Theology
- 226A-F. Exegesis of the Greek New Testament I
- 227A-C. Exegesis of the Greek New Testament II
228. Twentieth Century Continental Theology
- 230S. The Meaning of Religious Language
231. Seminar in Religion and Contemporary Thought
233. Modern Narratives and Religious Meanings
236. Luther and the Reformation in Germany
239. Introduction to Middle Egyptian
241. Problems in Reformation Theology
244. The Archaeology of Palestine in Hellenistic-Roman Times
245. Ethics in World Religions
246. Problems in Historical Theology
258. Coptic
262. Marxist Ideology and Christian Faith
281. Phenomenology and Religion
283. Islam and Modernism
284. The Religion and History of Islam
285. Introduction to the History of Religions
287. The Scriptures of Asia
288. Buddhist Thought and Practice
290. Current Problems in Christian Social Ethics
291. Historical Forms of Protestant Ethics
296. Religion on the American Frontier
302. Studies in the Intertestamental Literature
304. Aramaic
306. Language and Literature of the Dead Sea Scrolls
307. Syriac
308. Greek Patristic Texts
310. Readings in Judaica
318. Seminar in the Greek Fathers
320. Theology, Power, and Justice
322. Nineteenth-Century European Theology
- 323A. Comparative Semitic I
- 323B. Comparative Semitic II
324. Readings in the History of Religion
325. Philosophical Theology I
326. Philosophical Theology II
328. Twentieth-Century European Theology
337. Theology of St. Thomas Aquinas
338. Calvin and the Reformed Tradition
- 340-341. Seminar in the New Testament
- 350-351. Old Testament Seminar
352. Seminar in Christian Theology
353. Seminar on Text Criticism
360. Special Problems in Religion and Culture
370. Seminar in Religion and Literature
- 373-374. Elementary Akkadian
377. Contemporary American Dramatic Arts and Evolving Theological Forms
380. Existentialist Thought
383. Moral Theology in the Twentieth Century
384. Religious Dissent in American Culture
385. Religion in American Literature
386. Christianity in Dialogue with Other Faiths
389. Christian Ethics and Contemporary Culture
395. Christian Thought in Colonial America
396. Liberal Traditions in American Theology

Courses Currently Unscheduled

204. Origen
206. Christian Mysticism in the Middle Ages
237. History of the Ancient Near East
238. Jewish Responses to Christianity
242. Life after Death in Semitic Thought
243. Archaeology of Palestine in Biblical Times
247. Readings in Latin Theological Literature
248. The Theology of Karl Barth

- 251. The Counter-Reformation and the Development of Catholic Dogma
- 252. Nineteenth- and Twentieth-Century Roman Catholic Theology
- 255. Seminar in African Religions
- 264. The Sociology of the Black Church
- 265. The Religions of the West Africa Diaspora
- 280. The History of Religions
- 300. Systematic Theology
- 301. Seminar in Contemporary Christian Ethics
- 304A. Targumic Aramaic
- 311. Pharisaic Judaism in the First Century
- 312. Pauline Theology
- 313. The Apostolic Fathers
- 314. Judaism and Christianity in the New Testament
- 315-316. Seminar: History of Religions
- 317. Seminar in the Greek Apologists
- 319. The Gospel According to St. Matthew in Recent Research
- 327. Philosophical Method in Religious Studies
- 334. Theology and Reform in the Later Middle Ages
- 335. The English Church in the Eighteenth Century
- 339. The Radical Reformation
- 344. Zwingli and the Origins of Reformed Theology
- 387. Ethical Method
- 388. Ethics and Medicine
- 394. Christianity and the State
- 397. Contemporary American Theology
- 398. Colloquium on the Teaching of Religion
- 401. Colloquium in Biblical Studies

Romance Languages

Professor Phillip Stewart, Ph.D. (Yale), *Chairman and Director of Graduate Studies*

Professors

Thomas H. Cordle, Ph.D. (Yale); John M. Fein, Ph.D. (Harvard); Rafael Osuna, Ph.D. (Brown); Marcel Tetel, Ph.D. (Wisconsin); Bruce W. Wardropper, Ph.D. (Pennsylvania), *William H. Wannamaker Professor of Romance Languages*

Associate Professors

Ernesto Caserta, Ph.D. (Harvard); Miguel Garci-Gómez, Ph.D. (Catholic Univ.); Alexander Hull, Ph.D. (Washington); Linda Orr, Ph.D. (Yale); Jean-Jacques Thomas, *Doctorat de 3e Cycle (Univ. of Paris)*

Assistant Professors

Inez K. Hedges, Ph.D. (Wisconsin); Gustavo F. Pérez, Ph.D. (Michigan)

The Department of Romance Languages offers graduate work leading to the A.M. and Ph.D. degrees in French and Spanish. Requirements for the A.M. may be completed by submission of a thesis or by passing a comprehensive examination in the major field. Related work for the A.M. and Ph.D. degrees is required in a second Romance language or in any one or two of a number of other subject areas.

In order to undertake graduate study in Romance languages, the entering student should have credit for at least 18 semester hours (or equivalent) above the intermediate level in the major language.

French

Courses of Instruction

- 210. The Structure of French
- 211. History of the French Language
- 223. Semiotics for Literature
- 248. French Literature of the Seventeenth Century
- 251, 252. Literature of the Eighteenth Century
- 255. French Preromantic and Romantic Poetry
- 256. Modern Literature and History
- 257, 258. The Nineteenth-Century French Novel
- 263. Contemporary French Theater
- 265, 266. French Literature of the Twentieth Century
- 290S. Studies in a Contemporary Figure
- 325. French Prose of the Sixteenth Century
- 326. Topics in Renaissance Poetry

- 391, 392. French Seminar
- Graduate Reading Course

Courses Currently Unscheduled

- 240. Old French Literature
- 261. French Symbolism
- 264. Proust

Italian

Courses of Instruction

- 283. Italian Novel of the Novecento
- 284. Dante
- 285. Dante

Spanish

Courses of Instruction

- 210. History of the Spanish Language
- 245, 246. Modern and Contemporary Spanish-American Literature
- 251. The Origins of Spanish Prose Fiction
- 253. Cervantes
- 254. Drama of the Golden Age
- 258S. Spanish Lyric Poetry before 1700
- 275. Modern Spanish Poetry
- 276. Modern Spanish Drama
- 277. Modern Spanish Novel

Courses Currently Unscheduled

- 391, 392. Hispanic Seminar

Romance Languages

Courses of Instruction

- 218. The Teaching of Romance Languages

Slavic Languages and Literatures

Professor Magnus J. Krynski, Ph.D. (Columbia), *Chairman*

Associate Professor

Bronislas de Leval Jezierski, Ph.D. (Harvard)

The Department of Slavic Languages and Literatures offers graduate courses in Russian language and literature and limited training in the language and literature of Poland.

Students should have sufficient preparation in the Russian language to enable them to read Russian classical literature in the original. Any presently unscheduled course will be taught in any semester upon request.

Courses of Instruction

- 201, 202. Russian Novel of the Nineteenth Century
- 225S. Tolstoy
- 232. Dostoevsky

Courses Currently Unscheduled

- 230. Chekhov

Sociology

Professor Alan C. Kerckhoff, Ph.D. (Wisconsin), *Chairman*

Professor Joel Smith, Ph.D. (Northwestern), *Director of Graduate Studies*

Professors

Kurt W. Back, Ph.D. (Massachusetts Inst. of Tech.), *James B. Duke Professor of Sociology*; John C. McKinney, Ph.D. (Michigan State); George L. Maddox, Jr., Ph.D. (Michigan State); George C. Myers, Ph.D. (Washington); Erdman B. Palmore, Ph.D. (Columbia); Jack J. Preiss, Ph.D. (Michigan State); Ida H. Simpson, Ph.D. (North Carolina at Chapel Hill); Edward A. Tiryakian, Ph.D. (Harvard)

Associate Professors

Richard T. Campbell, Ph.D. (Wisconsin); John Wilson, D.Phil. (Univ. of Oxford)

Assistant Professors

Joanne Brown, Ph.D. (Pittsburgh); Gary Gereffi, Ph.D. (Yale); Angela O'Rand, Ph.D. (Temple)

Adjunct Associate Professor

Linda K. George, Ph.D. (Duke)

Research Associate Professor

Kenneth G. Manton, Ph.D. (Duke)

The department offers graduate work leading to the A.M. and Ph.D. degrees in sociology. Students beginning work toward an advanced degree should have com-

pleted a minimum of 12 semester hours of acceptable courses in sociology and an additional 12 semester hours in related work (e.g., other social sciences, statistics, computer science, philosophy, mathematics). Accepted applicants who have not had such preparation may be required to take work beyond the usual program requirements. Applicants for admission are required to take the verbal and quantitative aptitude tests of the Graduate Record Examination.

The department concentrates its Ph.D. training in two programs: life course analysis, and changing world societies. Each program has its own two-core-course requirement, but all share a six-course requirement covering theory (280, 281), methodology and research methods (296, 297), and statistics (293, 294). In addition, each program has an informal seminar series and expects student involvement in related research activities. In order to assure some breadth of training, all students are required to take at least four departmental courses outside the specific course requirements of both their chosen program and the departmental core requirements. Two additional courses outside the department in related work are also required, for a total of fifteen courses beyond the bachelor's degree.

There is a qualifying procedure after three semesters, or equivalent, to determine whether the student can proceed to the preliminary examination which consists of two four-hour written examinations and a two-hour oral examination covering the core curriculum and the program area chosen by the student. Further details concerning the general departmental program, the specialized programs, departmental facilities, the staff, ongoing research, and various stipends available may be obtained from the Director of Graduate Studies.

Courses of Instruction

201S. Social Change
202S. Social Organization
210. Comparative Race and Ethnic Relations
225. Medical Sociology
230. Social Aspects of Aging and Death
233S. Culture, Religion, and Modernity
234S. Political Economy of Development: Theories of Change in the Third World
241. Social Stratification
243. Population Dynamics and Social Change
260S. Science, Technology, and Society
261S. Science, Politics, and Government
276S. Social Structure and the Life Course
277S. Social Patterns of Personal Development
279S. Social Psychology
280S. Contemporary Sociological Theory
281S. Development of Sociological Theory
282S. Seminar on Canada
293. Introductory Statistical Analysis
294. Intermediate Statistical Analysis
296S. Research Methods and Methodology

297S. Data Collection and Analysis
298S, 299S. Seminar in Selected Topics

Courses Currently Unscheduled

205S. Complex Organizations
242. The Sociology of Occupations and Professions
244. Human Ecology and Urban Systems
295. Methodology in Sociology
301. Seminar in Human Fertility
302. Seminar in Migration
325. Social Aspects of Mental Illness and Treatment
345, 346. Demographic Techniques I and II
349, 350. Seminar in Selected Topics of Demography and Ecology
373, 374. Social Psychological Issues in Sociology
385. Seminar in Sociological Theory
386. Seminar in Sociological Theory
390. Seminar in Field Methods of Sociological Research
392. Individual Research in Sociology
397, 398. Seminar in Special Research

The University Program in Toxicology

Associate Professor William S. Lynn, Jr., M.D. (Columbia), *Director*
Associate Professor Mohamed B. Abou-Donia, Ph.D. (California at Berkeley), *Deputy Director*
Associate Professor Doyle G. Graham, M.D., Ph.D. (Duke), *Deputy Director*
Associate Professor Curtis J. Richardson, Ph.D. (Tennessee), *Deputy Director*

The University Program in Toxicology seeks to produce individuals with sound training in the scientific basis for research in toxicology who will advance the science of this discipline. After broad general courses in epidemiology and statistics, pathology, and mammalian toxicology, students will be trained in one of three tracks: (1) as

generalist toxicologists, with broad training in the principles and concepts of toxicology and the design of protocols for toxicological assessments; (2) as specialist toxicologists in those areas of toxicology research in which faculty members are currently productive—pulmonary toxicology, neurotoxicology, immunotoxicology, genetic toxicology (carcinogenesis), and biochemical toxicology; or (3) as ecotoxicologists with broad training in principles and concepts of both toxicology and ecology as they relate to the release, transport, exposure, accumulation, and the effects of toxics in the ecosystems.

The toxicology program faculty is comprised of members from the Departments of Anatomy, Biochemistry, Chemistry, Forestry and Environmental Studies, Microbiology and Immunology, Pathology, Pharmacology, Physiology, Zoology, and several departments in the School of Medicine.

Students seeking the Ph.D. in one of the participating Graduate School departments may make initial application to either the program or one of the departments. All who apply directly to the program will be considered for admission by the program and the department of the student's choice. Students who apply initially for graduate study in one of the departments may also be nominated by that department for admission to the program. It is expected that most students will have a strong undergraduate preparation in mathematics and the physical and biological sciences with demonstrated excellence of performance as judged by grades in course work and letters of recommendation from former instructors.

All students in the program will take a series of courses in toxicology as well as courses specified by his or her department. A student will be expected to choose a dissertation adviser in his or her department at least by the end of the first two semesters in the program, and will normally be expected to begin dissertation research during the third semester in residence. Upon satisfactorily completing all degree requirements in the program and in the department, students will be jointly recommended for the Ph.D. degree.

Further information may be obtained from the Director of the toxicology program (Department of Biochemistry).

Zoology

Professor Stephen A. Wainwright, Ph.D. (California at Berkeley), *Chairman*

Professor Henry M. Wilbur, Ph.D. (Michigan), *Director of Graduate Studies*

Professors

Richard T. Barber, Ph.D. (Stanford); John D. Costlow, Jr., Ph.D. (Duke); Donald J. Fluke, Ph.D. (Yale); Nicholas W. Gillham, Ph.D. (Harvard); John R. Gregg, Ph.D. (Princeton); Peter H. Klopfer, Ph.D. (Yale); Daniel A. Livingstone, Ph.D. (Yale), *James B. Duke Professor of Zoology*; R. Bruce Nicklas, Ph.D. (Columbia); Knut Schmidt-Nielsen, Ph.D. (Univ. of Copenhagen), *James B. Duke Professor of Physiology*; John E. R. Staddon, Ph.D. (Harvard); Vance A. Tucker, Ph.D. (California at Los Angeles); Steven Vogel, Ph.D. (Harvard); Calvin L. Ward, Ph.D. (Texas)

Associate Professors

Richard B. Forward, Jr., Ph.D. (California at Santa Barbara); John G. Lundberg, Ph.D. (Michigan); David R. McClay, Ph.D. (North Carolina at Chapel Hill); H. Frederik Nijhout, Ph.D. (Harvard); John P. Sutherland, Ph.D. (California at Berkeley)

Assistant Professors

William E. Conner, Ph.D. (Cornell); Mary M. Nijhout, Ph.D. (Harvard); Mark D. Rausher, Ph.D. (Cornell); Marcy K. Uyenoyama, Ph.D. (Stanford)

The Department of Zoology manages a variety of programs tailored to individual needs of students seeking the Ph.D. degree. The A.M. degree may be taken by students en route to the Ph.D., or by those who leave the doctoral program. Ordinarily, only students seeking the doctorate degree are admitted to the department.

In general, students entering the department will be equipped to pursue advanced degrees if they have completed an undergraduate major in biology along with some formal training in college-level chemistry, mathematics, physics, and foreign languages.

Nevertheless, in recognition and support of the modern trend toward interdisciplinary research, the department is prepared to accept promising students with less orthodox academic backgrounds and is ready to encourage any student wishing to undertake a program of study leading, in effect, to an interdisciplinary degree sponsored by the department.

Thus, all students are urged to search widely in both the *Bulletin of Duke University: Undergraduate Instruction* and the *Bulletin of Duke University: Graduate School* for information about the intellectual resources of the University. Special attention should be given to announcements of the Departments of Anatomy, Anthropology, Biochemistry, Botany, Chemistry, Geology, History, Mathematics, Microbiology and Immunology, Pharmacology, Philosophy, Physiology, Psychology, Sociology, and Zoology; announcements of the Schools of Engineering and Forestry and Environmental Studies should also be consulted.

Courses of Instruction

201L. Animal Behavior
203L. Marine Ecology
204L. Community Ecology
215L. Primary Productivity in the Seas
216L. Limnology
222L. Entomology
226L. Ichthyology
229. Morphogenetic Systems
233. Principles of Insect Behavior
237L. Systematic Biology
244. Principles of Immunology
247S. Photobiology
249. Biomechanics
250L. Physiology of Marine Animals
252. Comparative Physiology
258L. Laboratory Research Methods
259L. Laboratory in Biomechanics
261. Biology of Parasitism
264S. Chromosomes, DNA, and Evolution

269. Advanced Cell Biology
274L. Marine Invertebrate Zoology
275L. Advanced Invertebrate Zoology
278L. Invertebrate Developmental Biology
280. Principles of Genetics
283. Extrachromosomal Inheritance
286. Evolutionary Mechanisms
293L. Population Biology
295S, 296S. Seminar
353, 354. Research
360, 361. Tutorials

Courses Currently Unscheduled

224L. Herpetology
235. Evolutionary Systematics
239S. Biogeography
245. Radiation Biology
355, 356. Seminar

Related Programs

Genetics—The University Program. Genetics courses offered by the Department of Zoology are part of the University Program in Genetics; see announcement in this bulletin.

Marine Sciences—The University Program. Consult Marine Sciences in this bulletin for offerings at the Duke University Marine Laboratory.

Program in Tropical Biology. Fellowships are available for travel and subsistence in field-oriented programs in Latin America. Refer to Organization for Tropical Studies in this bulletin in the section on special programs.

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bulletin of
Duke University 1983-84
Graduate School



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Graduate School

EDITOR
Judy A. Beck
SENIOR EDITORIAL ASSISTANTS
Elizabeth Matheson
Deborah A. Earnhardt

ACADEMIC LIAISON
Frances C. Thomas
Assistant Dean

PHOTOGRAPHS
Thad Sparks
Jimmy Wallace

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The information in the bulletin applies to the academic year 1983-84 and is accurate and current, to the best of our knowledge, as of January, 1983. The University reserves the right to change programs of study, academic requirements, lecturers, teaching staffs, the announced University calendar, and other matters described in the bulletin without prior notice, in accordance with established procedures.

Duke University does not discriminate on the basis of race, color, national and ethnic origin, sex, handicap, or age in the administration of educational policies, admission policies, financial aid, employment, or any other University program or activity. It admits qualified students to all the rights, privileges, programs, and activities generally accorded or made available to students. For further information, call Dolores L. Burke, Equal Opportunity Officer, (919) 684-6578.

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Calendar of the Graduate School*

Summer 1983†

March		
21	Monday	Beginning of registration for resident students.
May		
3	Tuesday	Beginning this day, summer drop/adds must be approved by the academic dean or Director of Graduate Studies.
6	Friday	Last day for payment of Term I fees without \$25 late fee (before 4:30 P.M.).
12	Thursday	Term I classes begin.
16	Monday	Drop/add for Term I ends at 4:00 P.M.
June		
22	Wednesday	Last day for payment of Term II fees without \$25 late fee (before 4:30 P.M.).
24	Friday	Term I final examinations begin.
25	Saturday	Term I final examinations end.
28	Tuesday	Term II classes begin.
30	Thursday	Drop/add for Term II ends at 4:00 P.M.
August		
10	Wednesday	Term II final examinations begin.
11	Thursday	Term II final examinations end.

Fall 1983

August		
22	Monday, 8:30 A.M.-12:30 P.M. and 2:00-4:00 P.M., 127 Allen Building	Drop/add for graduate students who registered in March.
22	Monday	Consultations with Directors of Graduate Studies concerning course programs begin.
23-24	Tuesday-Wednesday, 9:00 A.M.-12:30 P.M. and 2:00-4:00 P.M., 127 Allen Building	Registration of all new and nonregistered returning students in the Graduate School.
23	Tuesday, 9:00 A.M., 111 Biological Sciences Building	English examination for foreign students. (See the chapter "Admission" for section on additional procedures for foreign students.)
30	Tuesday, 9:00 A.M.	Fall semester classes begin.
31	Wednesday, 1:00-3:00 P.M., 127 Allen Building	Late registration.
31	Wednesday, 1:00-3:00 P.M., 127 Allen Building	Drop/add. Final date for changing registration with reduction in fees, except a change due to the passing of preliminary or final degree examinations.
September		
1-2	Thursday-Friday, 8:30 A.M.-12:30 P.M. and 2:00-4:00 P.M., 127 Allen Building	Drop/add continues.
5	Monday, Labor Day	Classes are in session.
6-9	Tuesday-Friday, 8:30 A.M.-12:30 P.M. and 2:00-4:00 P.M., 127 Allen Building	Drop/add continues.
9	Friday, 8:30 A.M.-12:30 P.M. and 2:00-4:00 P.M., 127 Allen Building	Final date for changes in registration which involve adding courses, provided no reduction in fees is entailed.
23	Friday, 8:30 A.M.-12:30 P.M. and 2:00-4:00 P.M., 127 Allen Building	Final date for dropping course/seminar registration and adding equivalent units of research.
23	Friday, 8:30 A.M.-12:30 P.M. and 2:00-4:00 P.M., 127 Allen Building	Final date for changes in registration resulting from passing the preliminary or final degree examinations.
October		
14	Friday, 6:00 P.M.	Fall break begins.
19	Wednesday, 8:00 A.M.	Classes resume.

*The dates in this calendar are subject to change.

†The School of Forestry and Environmental Studies, the Fuqua School of Business, the Marine Laboratory, the Department of Health Administration, and the Department of Physical Therapy have different term lengths and/or starting dates during the summer; consult the appropriate bulletins and schedules.

November

- 1-2 Tuesday-Wednesday, 8:30 A.M.-12:30 P.M. and 2:00-4:00 P.M., 127 Allen Building—Registration for spring semester 1984.
22 Tuesday, 6:00 P.M.—Thanksgiving recess begins.
28 Monday, 8:00 A.M.—Classes resume.

December

- 5 Monday—Fall semester classes end.†
6-12 Tuesday-Monday—Reading period.
11 Sunday—Founders' Day.
13 Tuesday—Final examinations begin.
19 Monday—Final examinations end.

Spring 1984

January

- 4 Wednesday, 8:30 A.M.-12:30 P.M. and 2:00-4:00 P.M., 127 Allen Building—Drop/add for graduate students who registered in November.
5 Thursday, 2:00 P.M., 111 Biological Sciences Building—English examination for foreign students. (See the chapter "Admission" for section on additional procedures for foreign students.)
6 Friday, 9:00 A.M.-12:30 P.M. and 2:00-4:00 P.M., 127 Allen Building—Registration of all new and nonregistered returning students in the Graduate School.
9 Monday, 8:00 A.M.—Spring semester classes begin.
10 Tuesday, 1:00-3:00 P.M., 127 Allen Building—Late registration.
10 Tuesday, 1:00-3:00 P.M., 127 Allen Building—Drop/add. Final date for changing registration with reduction in fees except a change due to the passing of preliminary or final degree examinations.
11-13 Wednesday-Friday, 8:30 A.M.-12:30 P.M. and 2:00-4:00 P.M., 127 Allen Building—Drop/add continues.
16-20 Monday-Friday, 8:30 A.M.-12:30 P.M. and 2:00-4:00 P.M., 127 Allen Building—Drop/add continues.
20 Friday, 8:30 A.M.-12:30 P.M. and 2:00-4:00 P.M., 127 Allen Building—Final date for changes in registration which involve adding courses, provided no reduction in fees is entailed.

February

- 1 Wednesday—Final date for filing with the Graduate School office the Statement of Intention of receiving an advanced degree in May. Titles of theses and dissertations are to be filed concurrently with the Statement of Intention.
3 Friday—Final date for dropping course/seminar registration and adding equivalent units of research.
3 Friday—Final date for changes in registration resulting from passing the preliminary or final degree examinations.

March

- 2 Friday, 6:00 P.M.—Spring recess begins.
12 Monday, 8:00 A.M.—Classes resume.
19-20 Monday-Tuesday, 8:30 A.M.-12:30 P.M. and 2:00-4:00 P.M., 127 Allen Building—Registration for fall semester 1984, and beginning of registration for summer 1984.

April

- 2 Monday—Last day for submitting dissertations for Ph.D. and Ed.D. degrees.
16 Monday—Last day for submitting theses for master's degrees.
16 Monday—Spring semester classes end.†
17-23 Tuesday-Monday—Reading period.†
24 Tuesday—Final examinations begin.
30 Monday—Final examinations end.

May

- 5 Saturday—Commencement begins.
6 Sunday—Graduation exercises. Conferring of degrees.

†For 200-level courses, the length of the reading period is at the discretion of the instructor.

University Administration

General Administration

Terry Sanford, J.D., LL.D., D.H., L.H.D., D.P.A., *President*
H. Keith H. Brodie, M.D., *Chancellor and Acting Provost*
Charles B. Huestis, *Vice-President for Business and Finance*
William G. Anlyan, M.D., D.Sc., *Vice-President for Health Affairs*
Eugene J. McDonald, LL.M., *Vice-President for Government Relations and University Counsel*
William J. Griffith, A.B., *Vice-President for Student Affairs*
Stephen Cannada Harward, A.B., C.P.A., *Treasurer and Assistant Secretary*
J. Peyton Fuller, A.B., *Associate Vice-President and Corporate Controller*
Roger L. Marshall, A.B., *Secretary of the University*
Andrew G. Wallace, M.D., *Associate Vice-President for Health Affairs*
Joel L. Fleishman, LL.M., *Vice-Chancellor*

Graduate School Administration

Craufurd D. Goodwin, Ph.D., *Dean of the Graduate School*
Charles R. Young, Ph.D., *Associate Dean*
Frances C. Thomas, A.B., *Assistant Dean*
Donna Lee Giles, A.B., *Assistant to the Dean*
Louise W. Knight, M.A.T., *Coordinator, Office of Research Support*
Ivana Pelnar-Zaiko, Ph.D., *Associate Coordinator, Office of Research Support*

Executive Committee of the Graduate Faculty

Dean Craufurd D. Goodwin
Edward M. Arnett*
Roger C. Barr
Frank L. Borchardt
Peter Burian*
Richard O. Burns*
A. Leigh DeNeef*
Lawrence E. Evans
Irwin Fridovich
Nicholas W. Gillham*
Thomas A. Langford
Warren Lerner*
George C. Myers
Thomas H. Naylor
David E. Price*
Michael C. Reed*
Boyd R. Strain

*Term expires September 1983.

Graduate School Faculty

(As of November 1, 1982.)

The date denotes the first year of service at Duke University.

- Mohamed Bahie Abou-Donia (1975), Ph.D., Associate Professor of Pharmacology
Dolph O. Adams (1972), M.D., Ph.D., Professor of Pathology and Assistant Professor of Immunology
Irving E. Alexander (1963), Ph.D., Professor of Psychology
William K. Allard (1975), Ph.D., Professor of Mathematics
A. Tilo Alt (1961-65; 1967), Ph.D., Associate Professor of Germanic Languages and Literature
D. Bernard Amos (1962), M.D., James B. Duke Professor of Immunology
Carl Anderson (1955), Ph.D., Professor of English
C. William Anderson (1978), Ph.D., Assistant Professor of Chemistry
Nels C. Anderson (1966), Ph.D., Associate Professor of Physiology
Page A. W. Anderson (1973), M.D., Assistant Professor of Physiology
Janis Antonovics (1970), Ph.D., Professor of Botany
Mahadev L. Apte (1965), Ph.D., Associate Professor of Anthropology
Edward M. Arnett (1980), Ph.D., R. J. Reynolds Industries Professor of Chemistry
Kurt W. Back (1959), Ph.D., James B. Duke Professor of Sociology
Joseph Randle Bailey (1946), Ph.D., Professor of Zoology
Lloyd Richard Bailey (1971), Ph.D., Associate Professor of Old Testament
Paul A. Baker (1981), Ph.D., Assistant Professor of Geology
Steven W. Baldwin (1970), Ph.D., Associate Professor of Chemistry
Helmy Hamdollah Baligh (1967), Ph.D., Professor of Business Administration
Robert H. Ballantyne (1962), Ed.D., Associate Professor of Education
Bruce W. Ballard (1981), Ph.D., Assistant Professor of Computer Science
James David Barber (1972), Ph.D., James B. Duke Professor of Political Science and Professor of Public Policy Studies
Richard T. Barber (1970), Ph.D., Professor of Zoology and Professor of Botany
Robert Lloyd Barnes (1965), Ph.D., Professor of Forest Biochemistry
Roger C. Barr (1969), Ph.D., Professor of Biomedical Engineering
Elizabeth C. Bartlett (1982), Ph.D., Assistant Professor of Music
Robert Charles Bartlett (1976), M.A., Professor of Physical Therapy
Jorge Valls Bartolome (1978), Ph.D., Assistant Medical Research Professor of Pharmacology
Deepak Bastia (1979), Ph.D., Associate Professor of Microbiology
Joseph Battle (1970), Ph.D., Associate Professor of Business Administration
Gilbert Baumann (1976), Dr. Sc., Assistant Medical Research Professor of Physiology
William Waldo Beach (1946), Ph.D., Professor of Christian Ethics
Hie Ping Beall (1975), Ph.D., Assistant Medical Research Professor of Anatomy and Assistant Medical Research Professor of Physiology
Robert D. Behn (1973), Ph.D., Associate Professor of Public Policy Studies
Robert Paul Behringer (1982), Ph.D., Assistant Professor of Physics
Robert M. Bell (1972), Ph.D., Associate Professor of Biochemistry
Peter Brian Bennett (1972), Ph.D., Associate Professor of Physiology
Charles W. Bergquist (1972), Ph.D., Associate Professor of History
Leon Bernstein (1980), Ph.D., Adjunct Professor of Mathematics
James R. Bettman (1982), Ph.D., IBM Research Professor, Fuqua School of Business
*William Bevan (1974), Ph.D., William Preston Few Professor of Psychology
L. C. Biedenharn, Jr. (1961), Ph.D., Professor of Physics
Alan Biermann (1974), Ph.D., Associate Professor of Computer Science
Darell D. Bigner (1972), M.D., Ph.D., Professor of Pathology
Sandra H. Bigner (1977), M.D., Associate Professor of Pathology
Edward George Bilpuch (1962), Ph.D., Professor of Physics
Daniel E. Binkley (1982), Ph.D., Research Associate in Ecology
Mrinmay Biswas (1983), Ph.D., Associate Professor of Civil Engineering
John A. Bittkofer (1970), Ph.D., Associate in Clinical Biochemistry
Thorir D. Bjornsson (1978), M.D., Assistant Professor of Pharmacology
Kalman P. Bland (1973), Ph.D., Associate Professor of Religion
Colin C. Blaydon (1975), Ph.D., Professor of Public Policy Studies and Professor of Business Administration
J. I. Blum (1962), Ph.D., James B. Duke Professor of Physiology
Mary T. Boatwright (1979), Ph.D., Assistant Professor of Classical Studies
Dani P. Bolognesi (1971), Ph.D., Professor of Virology
Celia Bonaventura (1972), Ph.D., Assistant Medical Research Professor of Biochemistry
Joseph Bonaventura (1972), Ph.D., Assistant Medical Research Professor of Biochemistry

* On leave of absence.

Frank Borchardt (1971), Ph.D., *Associate Professor of Germanic Languages and Literature*
 Lloyd J. Borstelmann (1953), Ph.D., *Professor of Psychology*
 Edward H. Bossen (1972), M.D., *Professor of Pathology*
 Kevin W. Bowyer (1981), Ph.D., *Assistant Research Professor of Computer Science*
 Stephen G. Boyce (1981), Ph.D., *Adjunct Professor of Natural Resources*
 Robert T. Boyd (1980), Ph.D., *Assistant Professor of Environmental Studies*
 John E. Boynton (1968), Ph.D., *Professor of Botany*
 William D. Bradford (1966), M.D., *Professor of Pathology*
 David G. Bradley (1949), Ph.D., *Professor of Religion*
 Ralph Braibanti (1953), Ph.D., *James B. Duke Professor of Political Science*
 Eleanor F. Branch (1972), Ph.D., *Associate Professor of Physical Therapy*
 Robert N. Brandon (1979), Ph.D., *Andrew W. Mellon Assistant Professor of Philosophy*
 Philip L. Brock (1982), Ph.D., *Assistant Professor of Economics*
 Arnold Ralph Brody (1978), Ph.D., *Adjunct Assistant Professor of Pathology*
 Martin Bronfenbrenner (1971), Ph.D., *William R. Kenan, Jr. Professor of Economics and Lecturer in History*
 Joanne Brown (1980), Ph.D., *Assistant Professor of Sociology*
 Caroline A. Bruzelius (1981), Ph.D., *Andrew W. Mellon Assistant Professor of Art*
 C. Edward Buckley III (1963), M.D., *Assistant Professor of Microbiology and Immunology*
 Rebecca Buckley (1968), M.D., *Professor of Immunology*
 Louis J. Budd (1952), Ph.D., *Professor of English*
 Mary Vickers Burdett (1977), Ph.D., *Assistant Medical Research Professor of Microbiology*
 Donald S. Burdick (1962), Ph.D., *Associate Professor of Mathematics and Associate Professor of Biomedical Engineering*
 Peter C. Burger (1973), M.D., *Associate Professor of Pathology*
 Peter Burian (1968), Ph.D., *Associate Professor of Classical Studies*
 Marian Burke (1982), Ph.D., *Assistant Professor of Business Administration*
 Richard O. Burns (1964), Ph.D., *Professor of Microbiology*
 Richard M. Burton (1970), D.B.A., *Associate Professor of Business Administration*
 Ronald Richard Butters (1967), Ph.D., *Associate Professor of English*
 Clifford A. Butzin (1979), Ph.D., *Assistant Professor of Psychology*
 Gale H. Buzzard (1957), Ph.D., *Assistant Professor of Mechanical Engineering*
 Kenneth Charles Cadien (1982), Ph.D., *Assistant Professor of Materials Science*
 Edwin H. Cady (1973), Ph.D., *Andrew W. Mellon Professor in the Humanities*
 Clark R. Cahow (1960), Ph.D., *Professor in the Faculty of Arts and Sciences, History*
 John Clifford Cambier (1978), Ph.D., *Assistant Professor of Immunology*
 Richard T. Campbell (1974), Ph.D., *Associate Professor of Sociology*
 Enrico Mario Camporesi (1977), M.D., *Assistant Professor of Physiology*
 Nell Cant (1978), Ph.D., *Assistant Professor of Anatomy*
 Robert Capettini (1980), Ph.D., *Associate Professor of Business Administration*
 Peter F. Carbone (1966), Ed.D., *Associate Professor of Education*
 Christopher R. Carroll (1981), Ph.D., *Assistant Professor of Electrical Engineering*
 Robert C. Carson (1960), Ph.D., *Professor of Psychology*
 Reginald D. Carter (1971), Ph.D., *Adjunct Assistant Professor of Physiology*
 Matt Cartmill (1969), Ph.D., *Professor of Anatomy and Associate Professor of Anthropology*
 Ernesto Caserta (1970), Ph.D., *Associate Professor of Romance Languages*
 H. Craig Casey, Jr. (1979), Ph.D., *Professor of Electrical Engineering*
 John H. Casseday (1972), Ph.D., *Associate Professor of Psychology*
 John Cell (1962), Ph.D., *Professor of History*
 Jack B. Chaddock (1966), Sc.D., *Professor of Mechanical Engineering*
 William Chafe (1971), Ph.D., *Professor of History*
 Jagdish Chandra (1974), Ph.D., *Adjunct Professor of Mathematics*
 James H. Charlesworth (1969), Ph.D., *Associate Professor of Religion*
 Donald B. Chesnut (1965), Ph.D., *Professor of Chemistry*
 Norman L. Christensen, Jr. (1973), Ph.D., *Associate Professor of Botany*
 Elizabeth Ann Clark (1982), Ph.D., *Professor of Religion*
 Howard G. Clark (1968), Ph.D., *Professor of Biomedical Engineering and Professor of Materials Science*
 Frederic N. Cleaveland (1971), Ph.D., *Professor of Political Science*
 Charles T. Clotfelter (1979), Ph.D., *Associate Professor of Public Policy Studies and Associate Professor of Economics*
 Franklin H. Cocks (1972), Sc.D., *Professor of Materials Science*
 Kalman J. Cohen (1974), Ph.D., *Distinguished Bank Research Professor and Professor of Business Administration*
 John D. Coie (1968), Ph.D., *Associate Professor of Psychology*
 Jeffrey J. Collins (1974), Ph.D., *Associate Professor of Microbiology and Immunology*
 Joel Colton (1947), Ph.D., *Professor of History*
 William K. Condrell (1982), J.D., *Adjunct Professor of Forestry*
 P. Michael Conn (1978), Ph.D., *Associate Professor of Pharmacology*

- William E. Conner (1979), Ph.D., *Assistant Professor of Zoology*
 Cecilia A. Conrad (1982), Ph.D., *Assistant Professor of Economics*
 Robert Franklin Conrad (1978), Ph.D., *Assistant Professor of Economics*
 Robert M. Conroy (1981), D.B.A., *Assistant Professor of Business Administration*
 Philip J. Cook (1973), Ph.D., *Associate Professor of Public Policy Studies and Associate Professor of Economics*
 James P. Cooney, Jr. (1981), Ph.D., *Professor of Health Administration*
 Thomas Howard Cordle (1950), Ph.D., *Professor of Romance Languages*
 Joseph M. Corless (1972), M.D., Ph.D., *Associate Professor of Anatomy*
 Roger J. Corless (1970), Ph.D., *Associate Professor of Religion*
 Ronald B. Corley (1977), Ph.D., *Associate Professor of Immunology*
 Philip R. Costanzo (1968), Ph.D., *Professor of Psychology*
 Martin Joseph Costello III (1975), Ph.D., *Assistant Professor of Anatomy*
 John D. Costlow, Jr. (1959), Ph.D., *Professor of Zoology*
 Sheila J. Counce (1968), Ph.D., *Professor of Anatomy*
 Ellen F. Cox (1982), Ph.D., *Assistant Professor of Business Administration*
 John Crellin (1977), Ph.D., *Associate Professor of Community and Family Medicine (Medical History)*
 Peter Cresswell (1973), Ph.D., *Associate Professor of Immunology*
 Herbert F. Crovitz (1963), Ph.D., *Adjunct Professor of Psychology*
 Alvin L. Crumbliss (1970), Ph.D., *Associate Professor of Chemistry*
 Pedro Cuatrecasas (1980), M.D., *Adjunct Professor of Pharmacology*
 Chicita F. Culberson (1971), Ph.D., *Adjunct Professor of Botany and Senior Research Associate*
 William Louis Culberson (1955), Ph.D., *Professor of Botany*
 Ronald Y. Cusson (1970), Ph.D., *Professor of Physics*
 David G. Davies (1961), Ph.D., *Professor of Economics*
 Calvin D. Davis (1962), Ph.D., *Professor of History*
 James Norman Davis (1972), M.D., *Associate Professor of Pharmacology*
 Lucy T. Davis (1969), Ed.D., *Associate Professor of Education*
 Jeffrey R. Dawson (1972), Ph.D., *Associate Professor of Immunology*
 Eugene Davis Day (1962), Ph.D., *Professor of Immunology*
 Ruth S. Day (1978), Ph.D., *Associate Professor of Psychology*
 David C. Dellinger (1968), Ph.D., *Associate Professor of Business Administration*
 Frank C. De Lucia (1969), Ph.D., *Associate Professor of Physics*
 A. Leigh DeNeef (1969), Ph.D., *Associate Professor of English*
 Vincent W. Dennis (1973), M.D., *Assistant Professor of Physiology*
 Barbara Devaney (1980), Ph.D., *Assistant Professor of Public Policy Studies*
 Irving T. Diamond (1958), Ph.D., *James B. Duke Professor of Psychology, Professor of Physiology, and Lecturer in Anatomy*
 Joseph Di Bona (1967), Ph.D., *Associate Professor of Education*
 Richard T. Di Giulio (1982), Ph.D., *Assistant Professor of Ecotoxicology*
 Ronald J. DiPerna (1982), Ph.D., *Professor of Mathematics*
 Arif Dirlik (1971), Ph.D., *Associate Professor of History*
 David A. Dittman (1978), Ph.D., *Associate Professor of Business Administration*
 Virginia R. Domínguez (1979), Ph.D., *Assistant Professor of Anthropology*
 Fenner Douglass (1974), M.Mus., *Professor of Music*
 John W. Drake (1980), Ph.D., *Adjunct Professor in the Genetics Program*
 Bernard I. Duffey (1963), Ph.D., *Professor of English*
 Pamela W. Duncan (1979), M.A.C.T., *Assistant Professor of Physical Therapy*
 Robert F. Durden (1952), Ph.D., *Professor of History*
 George F. Dutrow (1976), Ph.D., *Adjunct Associate Professor of Forest Economics*
 Elaine Martha Eckel (1974), M.A., *Assistant Clinical Professor of Physical Therapy*
 Carol O. Eckerman (1972), Ph.D., *Associate Professor of Psychology*
 David M. Eddy (1981), Ph.D., *Professor of Public Policy Studies and Professor of Community and Family Medicine*
 Julie A. Edell (1981), Ph.D., *Assistant Professor of Business Administration*
 Eric L. Effmann (1977), M.D., *Assistant Professor of Anatomy*
 Jane G. Elchlepp (1960), M.D., Ph.D., *Associate Professor of Pathology*
 Albert Eldridge (1970), Ph.D., *Associate Professor of Political Science*
 Everett H. Ellinwood, Jr. (1966), M.D., *Professor of Pharmacology*
 Ernest Elsevier (1950), M.S., *Associate Professor of Mechanical Engineering*
 Sharyn Endow (1978), Ph.D., *Assistant Professor of Microbiology*
 Peter C. English (1978), M.D., Ph.D., *Assistant Professor of History*
 Robert M. Entman (1980), Ph.D., *Assistant Professor of Public Policy Studies and Assistant Professor of Political Science*
 Ann Epstein (1979), Ph.D., *Assistant Professor of Art*
 †Carl J. Erickson (1966), Ph.D., *Professor of Psychology*

†Sabbatical leave, September 1, 1983 through August 31, 1984.

Harold P. Erickson (1970), Ph.D., *Professor of Anatomy*
 Robert P. Erickson (1961), Ph.D., *Professor of Psychology and Associate Professor of Physiology*
 E. Harvey Estes, Jr. (1953), M.D., *Professor of Health Administration*
 Lawrence E. Evans (1963), Ph.D., *Professor of Physics*
 Richard B. Fair (1981), Ph.D., *Professor of Electrical Engineering*
 Henry A. Fairbank (1962), Ph.D., *Professor of Physics*
 David J. Falcone (1975), M.H.A., Ph.D., *Associate Professor of Health Administration and Assistant Professor of Political Science*
 John Morton Fein (1950), Ph.D., *Professor of Romance Languages*
 Arthur Bowles Ferguson (1939), Ph.D., *Professor of History*
 Oliver W. Ferguson (1957), Ph.D., *Professor of English*
 Bernard F. Fetter (1951), M.D., *Professor of Pathology*
 Peter G. Fish (1969), Ph.D., *Professor of Political Science*
 Daniel E. Flath (1977), Ph.D., *Assistant Professor of Mathematics*
 Joel Fleishman (1971), LL.M., *Professor of Law*
 Donald J. Fluke (1958), Ph.D., *Professor of Zoology*
 John D. Forsyth (1978), D.B.A., *Professor of Business Administration*
 Lloyd R. Fortney (1964), Ph.D., *Associate Professor of Physics*
 Richard B. Forward (1971), Ph.D., *Associate Professor of Zoology*
 Richard G. Fox (1968), Ph.D., *Professor of Anthropology*
 John Hope Franklin (1981), Ph.D., *James B. Duke Professor of History*
 Bertram O. Fraser-Reid (1983), Ph.D., *Professor of Chemistry*
 Deborah Anne Freund (1980), Ph.D., *Adjunct Assistant Professor of Health Administration*
 Irwin Fridovich (1958), Ph.D., *James B. Duke Professor of Biochemistry*
 Ernestine Friedl (1973), Ph.D., *James B. Duke Professor of Anthropology*
 James C. Fuchs (1979), M.D., *Burroughs Wellcome Assistant Professor of Clinical Pharmacology*
 Atwood D. Gaines (1980), M.P.H., Ph.D., *Assistant Professor of Anthropology*
 Thomas M. Gallie, Jr. (1954-55; 1956), Ph.D., *Professor of Computer Science*
 Miguel Garcí-Gómez (1973), Ph.D., *Associate Professor of Romance Languages*
 Grant W. Gardner (1981), Ph.D., *Assistant Professor of Business Administration*
 Devendra P. Garg (1972), Ph.D., *Professor of Mechanical Engineering*
 Raymond Gavins (1970), Ph.D., *Associate Professor of History*
 Scott Gehman, Jr. (1954), Ph.D., *Professor of Psychology in Education*
 Robert M. Geist III (1981), Ph.D., *Assistant Professor of Computer Science*
 Linda K. George (1976), Ph.D., *Adjunct Associate Professor of Sociology*
 Rhett Truesdale George, Jr. (1957), Ph.D., *Assistant Professor of Electrical Engineering*
 Gerald E. Gerber (1962), Ph.D., *Associate Professor of English*
 Gary Gereffi (1980), Ph.D., *Assistant Professor of Sociology*
 Nicholas W. Gillham (1968), Ph.D., *Professor of Zoology*
 Kenneth E. Glander (1975), Ph.D., *Associate Professor of Anthropology*
 Robert F. Gleckner (1978), Ph.D., *Professor of English*
 Rona Goffen (1978), Ph.D., *Associate Professor of Art*
 Martin P. Golding (1976), Ph.D., *Professor of Philosophy*
 Craufurd Goodwin (1962), Ph.D., *James B. Duke Professor of Economics*
 Lawrence C. Goodwyn (1971), Ph.D., *Associate Professor of History*
 Alfred T. Goshaw (1973), Ph.D., *Associate Professor of Physics*
 Henry G. Grabowski (1972), Ph.D., *Professor of Economics*
 Daniel A. Graham (1969), Ph.D., *Professor of Economics*
 Doyle G. Graham (1970), M.D., Ph.D., *Associate Professor of Pathology*
 Ronald C. Greene (1958), Ph.D., *Associate Professor of Biochemistry*
 Joseph C. Greenfield (1962), M.D., *Associate Professor of Physiology*
 Arno L. Greenleaf (1977), Ph.D., *Assistant Professor of Biochemistry*
 John R. Gregg (1957), Ph.D., *Professor of Zoology*
 Robert C. Gregg (1974), Ph.D., *Associate Professor of Patristics and Medieval Church History*
 Joseph M. Grieco (1982), Ph.D., *Assistant Professor of Political Science*
 Samson R. Gross (1960), Ph.D., *Professor of Genetics and Professor of Biochemistry*
 Walter R. Guild (1960), Ph.D., *Professor of Biophysics*
 John W. Gutknecht (1969), Ph.D., *Professor of Physiology*
 Laura T. Gutman (1979), M.D., *Associate Professor of Pharmacology*
 Norman Guttman (1951), Ph.D., *Professor of Psychology*
 Robert L. Habig (1969), Ph.D., *Assistant Professor of Clinical Biochemistry*
 Donald B. Hackel (1960), M.D., *Professor of Pathology*
 Herbert Hacker, Jr. (1965), Ph.D., *Associate Professor of Electrical Engineering*
 †Hugh Marshall Hall, Jr. (1952), Ph.D., *Professor of Political Science*
 Warren G. Hall (1982), Ph.D., *Associate Professor of Psychology*
 William C. Hall (1970), Ph.D., *Professor of Anatomy and Associate Professor of Psychology*

†Leave of absence, effective March 1, 1982.

William E. Hammond (1968), Ph.D., *Professor of Biomedical Engineering*
 W. Clay Hamner (1977), D.B.A., *Professor of Business Administration*
 Moo-Young Han (1967), Ph.D., *Professor of Physics*
 Stuart Handwerger (1971), M.D., *Assistant Professor of Physiology*
 Charles Morgan Harman (1961), Ph.D., *Professor of Mechanical Engineering*
 William J. Hart (1977), M.P.A., *Adjunct Professor of Forestry and Environmental Studies*
 Thomas M. Havrilesky (1969-70; 1971), Ph.D., *Professor of Economics*
 Catherine Hawes (1981), Ph.D., *Assistant Professor of Public Policy Studies*
 Milton Heath (1975), LL.B., *Adjunct Professor of Environmental Law*
 Inez K. Hedges (1976), Ph.D., *Assistant Professor of Romance Languages*
 Christine R. Hekman (1981), Ph.D., *Assistant Professor of Business Administration*
 Henry Hellmers (1965), Ph.D., *Professor of Botany and Professor of Forestry*
 Robert William Hensens (1968), Ph.D., *Associate Professor of Chemistry*
 Stuart C. Henry (1959), Ph.D., *Professor of American Christianity*
 Eric Herbst (1980), Ph.D., *Associate Professor of Physics*
 Jan Herlinger (1977), Ph.D., *Assistant Professor of Music*
 Duncan Heron (1950), Ph.D., *Professor of Geology*
 Michael Steven Hershfield (1976), M.D., *Assistant Professor of Biochemistry*
 Frederick Herzog (1960), Th.D., *Professor of Systematic Theology*
 Elizabeth G. Higdon (1980), Ph.D., *Assistant Professor of Art*
 Timothy K. Hight (1977), Ph.D., *Assistant Professor of Mechanical Engineering*
 Robert L. Hill (1961), Ph.D., *James B. Duke Professor of Biochemistry*
 Michael Lee Hines (1978), Ph.D., *Assistant Medical Research Professor of Physiology*
 John F. Hoadley (1979), Ph.D., *Assistant Professor of Political Science*
 Robert M. Hochmuth (1978), Ph.D., *Professor of Biomedical Engineering*
 Richard Earl Hodel (1965), Ph.D., *Associate Professor of Mathematics*
 Irving B. Holley, Jr. (1947), Ph.D., *Professor of History*
 Edward W. Holmes (1974), M.D., *Assistant Professor of Biochemistry*
 Ole R. Holsti (1974), Ph.D., *George V. Allen Professor of Political Science*
 Donald L. Horowitz (1980), LL.M., Ph.D., *Professor of Public Policy Studies and Professor of Political Science*
 C. Russell Horres, Jr. (1976), Ph.D., *Adjunct Assistant Professor of Physiology*
 Jerry F. Hough (1973), Ph.D., *Professor of Political Science and Professor of Public Policy Studies*
 Tao-shih Hsieh (1981), Ph.D., *Assistant Professor of Biochemistry*
 William J. Hubbard (1978), Ph.D., *Assistant Medical Research Professor of Immunology*
 Joel C. Huber (1978), Ph.D., *Associate Professor of Business Administration*
 Thomas M. Huber (1978), Ph.D., *Assistant Professor of History*
 John S. Hughes (1976), Ph.D., *Associate Professor of Business Administration*
 Alexander Hull (1962), Ph.D., *Associate Professor of Romance Languages*
 William F. Hyde (1979), Ph.D., *Assistant Professor of Forestry and Environmental Studies*
 William L. Hylander (1971), Ph.D., *Professor of Anatomy and Associate Professor of Anthropology*
 Kathryn N. Jackson (1982), Ph.D., *Assistant Professor of Philosophy*
 Wallace Jackson (1965), Ph.D., *Associate Professor of English*
 B. Jon Jaeger (1972), Ph.D., *Professor of Health Administration*
 Emma Raff Jakoi (1977), Ph.D., *Assistant Professor of Anatomy*
 Harold R. Jantz (1976), Ph.D., *Visiting Professor of Germanic Languages and Literature*
 Benjamin A. Jayne (1976), Ph.D., *Professor of Forestry*
 Peter W. Jeffs (1964), Ph.D., *Professor of Chemistry*
 Robert B. Jennings (1975), M.D., *James B. Duke Professor of Pathology*
 Bronislas de Leval Jezierski (1958), Ph.D., *Associate Professor of Slavic Languages and Literatures*
 Randy L. Jirtle (1977), Ph.D., *Assistant Professor of Pathology*
 Frans F. Jöbsis (1964), Ph.D., *Professor of Physiology*
 Sheridan Johns III (1970), Ph.D., *Associate Professor of Political Science*
 Charles B. Johnson (1956), Ed.D., *Associate Professor of Education*
 Edward A. Johnson (1963), M.D., *James B. Duke Professor of Physiology*
 Terry W. Johnson, Jr. (1954), Ph.D., *Professor of Botany*
 William W. Johnston (1963), M.D., *Professor of Pathology*
 William Thomas Joines (1966), Ph.D., *Professor of Electrical Engineering*
 Wolfgang Karl Joklik (1968), D.Phil., *James B. Duke Professor of Microbiology and Immunology*
 Buford Jones (1962), Ph.D., *Associate Professor of English*
 Phillip L. Jones (1977), Ph.D., *Associate Professor of Materials Science*
 Rayford S. Jones (1971), M.D., *Assistant Professor of Physiology*
 Burke H. Judd (1980), Ph.D., *Adjunct Professor in the Genetics Program*
 Arnold D. Kaluzny (1975), Ph.D., *Adjunct Professor of Health Administration*
 Henry Kamin (1948), Ph.D., *Professor of Biochemistry*
 Kirk R. Karwan (1981), Ph.D., *Assistant Professor of Business Administration*
 Bernard Kaufman (1968), Ph.D., *Associate Professor of Biochemistry*
 Richard F. Kay (1973), Ph.D., *Associate Professor of Anatomy and Adjunct Associate Professor of Anthropology*

Jack D. Keene (1979), Ph.D., *Assistant Professor of Virology*
 Thomas F. Keller (1959), Ph.D., *R. J. Reynolds Industries Professor of Business Administration*
 Allen C. Kelley (1972), Ph.D., *Professor of Economics*
 Alan C. Kerckhoff (1958), Ph.D., *Professor of Sociology*
 Robert B. Kerr (1965), Ph.D., *Professor of Electrical Engineering*
 Gregory A. Kimble (1952-68; 1977), Ph.D., *Professor of Psychology*
 Kent P. Kimbrough (1981), Ph.D., *Assistant Professor of Economics*
 Duncan T. Kinkad (1978), Ph.D., *Andrew W. Mellon Assistant Professor of Art*
 Warren Kirkendale (1967), Ph.D., *Professor of Music*
 Norman Kirshner (1956), Ph.D., *Professor of Pharmacology and Professor of Biochemistry*
 Joseph Weston Kitchen, Jr. (1962), Ph.D., *Associate Professor of Mathematics*
 Gordon K. Klintworth (1964), M.D., Ph.D., *Professor of Pathology*
 Peter H. Klopfer (1958), Ph.D., *Professor of Zoology*
 Kenneth R. Knoerr (1961), Ph.D., *Professor of Forest Meteorology and Associate Professor of Botany*
 John A. Koepke (1979), M.D., *Professor of Pathology*
 J. Mailen Kootsey (1971-76; 1979), Ph.D., *Associate Research Professor of Computer Science*
 Hillel S. Koren (1976), Ph.D., *Associate Medical Research Professor of Immunology*
 Allan Kornberg (1965), Ph.D., *Professor of Political Science*
 Wesley A. Kort (1965), Ph.D., *Professor of Religion*
 David Paul Kraines (1970), Ph.D., *Associate Professor of Mathematics*
 Nicholas Michael Kredich (1968), M.D., *Assistant Professor of Biochemistry*
 Irwin Kremen (1963), Ph.D., *Assistant Professor of Psychology*
 William R. Krigbaum (1952), Ph.D., *James B. Duke Professor of Chemistry*
 Joseph J. Kruzel (1976), Ph.D., *Assistant Professor of Political Science*
 Magnus Jan Krynski (1966), Ph.D., *Professor of Slavic Languages and Literatures*
 Cynthia Moreton Kuhn (1978), Ph.D., *Assistant Professor of Pharmacology*
 Bruce R. Kuniholm (1977), Ph.D., *Assistant Professor of Public Policy Studies and Assistant Professor of History*
 Johannes A. Kylstra (1965), M.D., Ph.D., *Associate Professor of Physiology*
 Leon Lack (1965), Ph.D., *Professor of Pharmacology*
 Creighton Lacy (1953), Ph.D., *Professor of World Christianity*
 Martin Lakin (1958), Ph.D., *Professor of Psychology*
 Michael K. Lamvik (1982), Ph.D., *Assistant Professor of Anatomy*
 David L. Lange (1971), LL.B., *Professor of Public Policy Studies and Communications Policy*
 Peter Lange (1982), Ph.D., *Associate Professor of Political Science*
 Thomas A. Langford (1956), Ph.D., *Professor of Systematic Theology*
 Peter K. Lauf (1968), M.D., *Professor of Physiology*
 Dan Laughhunn (1968-75; 1976), D.B.A., *Professor of Business Administration*
 Gregory F. Lawler (1979), Ph.D., *Assistant Professor of Mathematics*
 Bruce B. Lawrence (1971), Ph.D., *Professor of Religion*
 Richard H. Leach (1955), Ph.D., *Professor of Political Science*
 Harold E. Lebovitz (1962), M.D., *Associate Professor of Physiology*
 Robert Lefkowitz (1973), M.D., *Assistant Professor of Biochemistry*
 Warren Lerner (1961), Ph.D., *Professor of History*
 Roy J. Lewicki (1977), Ph.D., *Associate Professor of the Practice of Organizational Behavior*
 Arie Y. Lewin (1974), Ph.D., *Professor of Business Administration*
 H. Gregg Lewis (1975), Ph.D., *Professor of Economics*
 Harold Walter Lewis (1946), Ph.D., *University Distinguished Service Professor of Physics*
 Melvyn Lieberman (1968), Ph.D., *Professor of Physiology*
 Chia-Sheng Lin (1981), Ph.D., *Assistant Professor of Anatomy*
 C. Eric Lincoln (1976), Ph.D., *Professor of Sociology of Religion*
 Joseph Lipscomb, Jr. (1974), Ph.D., *Associate Professor of Public Policy Studies*
 Daniel A. Livingstone (1956), Ph.D., *James B. Duke Professor of Zoology*
 Charles H. Lochmüller (1969), Ph.D., *Professor of Chemistry*
 Gregory R. Lockhead (1965), Ph.D., *Professor of Psychology*
 Charles Houston Long (1974), Ph.D., *Professor of Religion*
 William Longley (1968), Ph.D., *Associate Professor of Anatomy*
 Donald Loveland (1973), Ph.D., *Professor of Computer Science*
 Peter W. Lucas (1977), Ph.D., *Assistant Professor of Physics*
 John Charles Lucchesi (1980), Ph.D., *Adjunct Professor in the Genetics Program*
 Michael I. Luger (1980), Ph.D., *Assistant Professor of Public Policy Studies and Assistant Professor of Economics*
 William L. Luken, Jr. (1976), Ph.D., *Assistant Professor of Chemistry*
 John G. Lundberg (1970), Ph.D., *Associate Professor of Zoology*
 William S. Lynn, Jr. (1954), M.D., *Associate Professor of Biochemistry*
 John M. McCann (1978), Ph.D., *Associate Professor of Business Administration*
 Kenneth S. McCarty (1959), Ph.D., *Professor of Biochemistry*
 Kenneth Scott McCarty, Jr. (1976), M.D., Ph.D., *Associate Professor of Pathology*
 David R. McClay (1973), Ph.D., *Associate Professor of Zoology and Assistant Professor of Immunology*

John B. McConahay (1974), Ph.D., *Associate Professor of Public Policy Studies and Associate Professor of Psychology*

James H. McElhaney (1973), Ph.D., *Professor of Biomedical Engineering*

Marjorie McElroy (1970), Ph.D., *Associate Professor of Economics*

Philip A. McHale (1972), Ph.D., *Adjunct Assistant Professor of Physiology*

Thomas J. McIntosh (1977), Ph.D., *Assistant Professor of Anatomy*

Margaret A. McKean (1974), Ph.D., *Associate Professor of Political Science*

Patrick A. McKee (1969), M.D., *Assistant Professor of Biochemistry*

John C. McKinney (1957), Ph.D., *Professor of Sociology*

Thomas J. McManus (1961), M.D., *Associate Professor of Physiology*

James O. McNamara (1973), M.D., *Assistant Professor of Pharmacology*

Andrew T. McPhail (1968), Ph.D., *Professor of Chemistry*

Ross D. E. MacPhee (1979), Ph.D., *Assistant Professor of Anatomy*

George L. Maddox, Jr. (1960), Ph.D., *Professor of Sociology*

Wesley A. Magat (1974), Ph.D., *Associate Professor in Fuqua School of Business and Associate Professor of Public Policy Studies*

Lynn A. Maguire (1982), Ph.D., *Assistant Professor and Research Associate in Forest Ecology*

Edward P. Mahoney (1965), Ph.D., *Professor of Philosophy*

Steven F. Maier (1971), Ph.D., *Associate Professor of Business Administration*

Lazaro J. Mandel (1972), Ph.D., *Associate Professor of Physiology*

Kenneth G. Manton (1977), Ph.D., *Adjunct Associate Professor of Sociology*

Richard B. Marchase (1978), Ph.D., *Assistant Professor of Anatomy*

Carlos M. Marin (1982), Ph.D., *Assistant Professor of Hydrology and Assistant Professor of Civil Engineering*

Peter N. Marinos (1968), Ph.D., *Professor of Electrical Engineering and Professor of Computer Science*

Gail R. Marsh (1969), Ph.D., *Lecturer in Psychology*

David V. Martin (1962), Ed.D., *Associate Professor of Education*

Seymour Mauskopf (1964), Ph.D., *Professor of History*

Mary E. Mayesky (1979), Ph.D. *Assistant Professor of Education*

Miguel A. Medina, Jr. (1976), Ph.D., *Associate Professor of Civil Engineering*

Elgin W. Mellow, Jr. (1965), Ph.D., *Associate Professor of English*

Robert J. Melosh (1978), Ph.D., *Professor of Civil Engineering*

Daniel B. Menzel (1971), Ph.D., *Professor of Pharmacology*

Richard S. Metzgar (1962), Ph.D., *Professor of Immunology*

Johannes Horst Max Meyer (1959), Ph.D., *Professor of Physics*

Carol L. Meyers (1979), Ph.D., *Assistant Professor of Religion*

Eric M. Meyers (1969), Ph.D., *Professor of Religion*

George Michalopoulos (1977), M.D., Ph.D., *Assistant Professor of Pathology*

Michael L. Michlin (1977), Ph.D., *Assistant Professor of Education*

Martin Miller (1970), Ph.D., *Associate Professor of History*

Sara Elizabeth Miller (1973), Ph.D., *Assistant Medical Research Professor of Microbiology*

Elliott Mills (1968), Ph.D., *Professor of Pharmacology and Associate Professor of Physiology*

Thomas G. Mitchell (1974), Ph.D., *Associate Professor of Mycology*

Paul L. Modrich (1976), Ph.D., *Associate Professor of Biochemistry*

Gerald Monsman (1965), Ph.D., *Professor of English*

John W. Moore (1961), Ph.D., *Professor of Physiology*

Lawrence C. Moore, Jr. (1966), Ph.D., *Associate Professor of Mathematics*

Richard C. Morey (1978), Ph.D., *Professor of the Practice of Management Sciences*

Montrose J. Moses (1959), Ph.D., *R. J. Reynolds Industries Professor in Medical Education in the Department of Anatomy*

Bruce J. Muga (1967), Ph.D., *Professor of Civil Engineering*

Roland E. Murphy (1967-68; 1971), S.T.D., *Professor of Old Testament*

George C. Myers (1968), Ph.D., *Professor of Sociology*

J. Victor Nadler (1978), Ph.D., *Assistant Professor of Pharmacology*

Sydney Nathans (1966), Ph.D., *Associate Professor of History*

Aubrey Willard Naylor (1952), Ph.D., *James B. Duke Professor of Botany*

Thomas H. Naylor (1964), Ph.D., *Professor of Economics*

Steven G. Nelson (1979), Ph.D., *Assistant Professor of Physical Therapy*

Francis Newton (1967), Ph.D., *Professor of Latin in Classical Studies*

Charles Adam Nichol (1970), Ph.D., *Adjunct Professor of Pharmacology*

David Bruce Nickerson (1981), Ph.D., *Assistant Professor of Economics*

Robert Bruce Nicklas (1965), Ph.D., *Professor of Zoology and Professor of Anatomy*

Frederik Nijhout (1977), Ph.D., *Associate Professor of Zoology*

Mary M. Nijhout (1982), Ph.D., *Assistant Professor of Zoology*

Loren W. Nolte (1966), Ph.D., *Professor of Electrical Engineering and Professor of Biomedical Engineering*

Yasuhiko Nozaki (1966), Ph.D., *Associate in Biochemistry*

Holger O. Nygard (1960), Ph.D., *Professor of English*

John F. Oates (1967), Ph.D., *Professor of Ancient History in Classical Studies*

Jean Fox O'Barr (1969), Ph.D., *Part-Time Associate Professor of Political Science*
 William M. O'Barr (1969), Ph.D., *Professor of Anthropology*
 Fearghus O'Foghludha (1975), Ph.D., *Adjunct Professor of Physics*
 Angela O'Rand (1979), Ph.D., *Assistant Professor of Sociology*
 Linda Orr (1980), Ph.D., *Associate Professor of Romance Languages*
 Robert T. Osborn (1954), Ph.D., *Professor of Religion*
 Suydam Osterhout (1959), M.D., Ph.D., *Professor of Microbiology*
 Rafael Osuna (1977), Ph.D., *Professor of Romance Languages*
 Athos Ottolenghi (1959), M.D., *Professor of Pharmacology*
 Harry Ashton Owen, Jr. (1951), Ph.D., *Professor of Electrical Engineering*
 George M. Padilla (1965), Ph.D., *Associate Professor of Physiology*
 Ellis B. Page (1979), Ed.D., *Professor of Education and Lecturer in Psychology*
 David L. Paletz (1967), Ph.D., *Professor of Political Science*
 Richard A. Palmer (1966), Ph.D., *Professor of Chemistry*
 Richard G. Palmer (1977), Ph.D., *Assistant Professor of Physics*
 Erdman B. Palmore (1967), Ph.D., *Professor of Sociology*
 William Leslie Pardon (1977), Ph.D., *Associate Professor of Mathematics*
 Harry B. Partin (1964), Ph.D., *Associate Professor of Religion*
 Eric I. Pas (1980), Ph.D., *Assistant Professor of Civil Engineering*
 Merrell Lee Patrick (1964), Ph.D., *Professor of Computer Science*
 David T. Patterson (1980), Ph.D., *Adjunct Assistant Professor of Botany*
 John W. Payne (1977), Ph.D., *Associate Professor of Business Administration and Lecturer in Psychology*
 William Bernard Peach (1951), Ph.D., *Professor of Philosophy*
 George Wilbur Pearsall (1964), Sc.D., *Professor of Mechanical Engineering and Materials Science and Professor of Public Policy Studies*
 J. Jeffrey Peirce (1981), Ph.D., *Associate Professor of Civil Engineering*
 Gustavo F. Pérez (1978), Ph.D., *Assistant Professor of Romance Languages*
 Ronald D. Perkins (1968), Ph.D., *Professor of Geology*
 David W. Peterson (1973), Ph.D., *Professor of Business Administration*
 Henry J. Petroski (1980), Ph.D., *Associate Professor of Civil Engineering*
 Leland R. Phelps (1961), Ph.D., *Professor of Germanic Languages and Literature*
 Jane Philpott (1951), Ph.D., *Professor of Botany and Professor of Wood Anatomy*
 Orrin Pilkey (1965), Ph.D., *Professor of Geology*
 Theo C. Pilkington (1961), Ph.D., *Professor of Biomedical Engineering and Professor of Electrical Engineering*
 David Stephen Pisetsky (1978), M.D., Ph.D., *Assistant Professor of Immunology*
 Salvatore V. Pizzo (1976), M.D., Ph.D., *Associate Professor of Pathology and Assistant Professor of Biochemistry*
 Jacques C. Poirier (1955), Ph.D., *Professor of Chemistry*
 Joseph A. Porter (1980), Ph.D., *Assistant Professor of English*
 Ned Allen Porter (1969), Ph.D., *Professor of Chemistry*
 Carl J. Posy (1981), Ph.D., *Associate Professor of Philosophy*
 William H. Poteat (1960), Ph.D., *Professor of Religion and Professor of Comparative Studies*
 Philip Pratt (1966), M.D., *Professor of Pathology*
 Jack J. Preiss (1959), Ph.D., *Professor of Sociology*
 David Eugene Price (1973), Ph.D., *Professor of Political Science and Professor of Public Policy Studies*
 James Ligon Price, Jr. (1952), Ph.D., *Professor of Religion*
 Louis DuBose Quin (1957), Ph.D., *James B. Duke Professor of Chemistry*
 Naomi Quinn (1972), Ph.D., *Associate Professor of Anthropology*
 K. V. Rajagopalan (1966), Ph.D., *Professor of Biochemistry*
 Charles William Ralston (1954), Ph.D., *Professor of Forest Soils*
 Dietolf Ramn (1971), Ph.D., *Associate Research Professor of Computer Science*
 Joseph S. Ramus (1978), Ph.D., *Associate Professor of Botany*
 Dale B. J. Randall (1957), Ph.D., *Professor of English*
 Mark D. Rausher (1978), Ph.D., *Assistant Professor of Zoology*
 Kenneth H. Reckhow (1980), Ph.D., *Assistant Professor of Forestry and Environmental Studies and Assistant Professor of Civil Engineering*
 William M. Reddy (1977), Ph.D., *Assistant Professor of History*
 Michael Charles Reed (1974), Ph.D., *Professor of Mathematics*
 Michael Kay Reedy (1969), M.D., *Associate Professor of Anatomy*
 Keith Arnold Reimer (1975), Ph.D., M.D., *Associate Professor of Pathology*
 Richard J. Rendleman (1980), Ph.D., *Associate Professor of Business Administration*
 Jacqueline A. Reynolds (1969), Ph.D., *Professor of Physiology*
 John F. Richards (1977), Ph.D., *Professor of History*
 Curtis J. Richardson (1977), Ph.D., *Associate Professor of Resource Ecology*
 David Claude Richardson (1969), Ph.D., *Associate Professor of Biochemistry*
 Lawrence Richardson, Jr. (1966), Ph.D., *James B. Duke Professor of Latin in Classical Studies*
 William E. Ricks (1980), Ph.D., *Assistant Professor of Business Administration*

Kent J. Rigsby (1971), Society of Fellows (Harvard), *Associate Professor of Classical Studies*
 Mary Ellen Riordan (1978), M.S., *Assistant Clinical Professor of Physical Therapy*
 Nathan Russell Roberson (1963), Ph.D., *Professor of Physics*
 George W. Roberts (1971), Ph.D., *Associate Professor of Philosophy*
 D. W. Robertson (1982), Ph.D., *Visiting Professor of English*
 J. David Robertson (1966), M.D., Ph.D., *James B. Duke Professor of Anatomy*
 Hugh G. Robinson (1964), Ph.D., *Professor of Physics*
 Herman R. Robl (1959-64; 1966), Ph.D., *Adjunct Professor of Physics*
 Alex Roland (1981), Ph.D., *Associate Professor of History*
 James L. Rolleston (1975), Ph.D., *Associate Professor of Germanic Languages and Literature*
 Gerald Martin Rosen (1972), Ph.D., *Associate Professor of Pharmacology*
 Arnold L. Rosenberg (1981), Ph.D., *Professor of Computer Science*
 Donald Karl Rosenberg (1976), Ph.D., *Assistant Professor of Germanic Languages and Literature*
 Bruce R. Rosendahl (1976), Ph.D., *Associate Professor of Geology*
 Allen D. Roses (1970), M.D., *Assistant Professor of Biochemistry*
 Wendell F. Rosse (1966), M.D., *Professor of Immunology*
 Susan Roth (1973), Ph.D., *Associate Professor of Psychology*
 Jack P. Royer (1978), Ph.D., *Assistant Professor of Forestry and Environmental Studies*
 David C. Rubin (1978), Ph.D., *Associate Professor of Psychology*
 Clyde de Loache Ryals (1973), Ph.D., *Professor of English*
 Harvey J. Sage (1964), Ph.D., *Associate Professor of Biochemistry and Associate Professor of Immunology*
 Edward A. Saibel (1975), Ph.D., *Adjunct Professor of Civil Engineering*
 John V. Salzano (1958), Ph.D., *Professor of Physiology*
 Alfred Paul Sanfilippo (1979), M.D., Ph.D., *Assistant Professor of Pathology*
 David H. Sanford (1970), Ph.D., *Professor of Philosophy*
 Robert N. Sawyer (1976), Ed.D., *Associate Professor of Education and Lecturer in Psychology*
 Frederick H. Schachat (1977), Ph.D., *Assistant Professor of Anatomy*
 David G. Schaeffer (1978), Ph.D., *Professor of Mathematics*
 Saul M. Schanberg (1967), M.D., Ph.D., *Professor of Pharmacology*
 Harold Schiffman (1963), Ph.D., *Professor of Psychology*
 Susan S. Schiffman (1972), Ph.D., *Lecturer in Psychology*
 William H. Schlesinger (1980), Ph.D., *Assistant Professor of Botany*
 Roger W. Schmenner (1980), Ph.D., *Associate Professor of Business Administration*
 Knut Schmidt-Nielsen (1952), Ph.D., *James B. Duke Professor of Physiology*
 Chadmark L. Schoen (1982), Ph.D., *Assistant Professor of Mathematics*
 Stanley Clifford Schold, Jr. (1978), M.D., *Assistant Professor of Pathology*
 David W. Schomberg (1968), Ph.D., *Associate Professor of Physiology*
 Maria E. Schonbek (1982), Ph.D., *Associate Professor of Mathematics*
 Herbert L. Schuette (1981), Ph.D., *Assistant Professor of Business Administration*
 Anne Firor Scott (1961), Ph.D., *William K. Boyd Professor of History*
 David W. Scott (1971), Ph.D., *Professor of Immunology*
 William E. Scott (1958), Ph.D., *Professor of History*
 Richard A. Scoville (1961), Ph.D., *Associate Professor of Mathematics*
 Richard B. Searles (1965), Ph.D., *Associate Professor of Botany*
 W. David Sedwick (1976), Ph.D., *Assistant Medical Research Professor of Microbiology*
 Tilman Seebass (1977), Ph.D., *Associate Professor of Music*
 Hillard Foster Seigler (1967), M.D., *Professor of Immunology*
 David G. Shand (1978), Ph.D., M.B., *Professor of Pharmacology*
 Michael E. Shapiro (1980), Ph.D., *Assistant Professor of Art*
 Edward J. Shaughnessy, Jr. (1975), Ph.D., *Associate Professor of Mechanical Engineering*
 Barbara R. Shaw (1975), Ph.D., *Associate Professor of Chemistry*
 Michael Shearer (1979), D.Phil., *Assistant Professor of Mathematics*
 John Shelburne (1973), M.D., Ph.D., *Associate Professor of Pathology*
 Marion L. Shepard (1967), Ph.D., *Professor of Materials Science*
 Blair H. Sheppard (1981), Ph.D., *Assistant Professor of Business Administration*
 Joseph R. Shoenfield (1952), Ph.D., *Professor of Mathematics*
 Brij Bhushan Shrivastav (1973), Ph.D., *Assistant Medical Research Professor of Pharmacology*
 James N. Siedow (1976), Ph.D., *Associate Professor of Botany*
 Lewis M. Siegel (1968), Ph.D., *Associate Professor of Biochemistry*
 Sidney Arthur Simon (1974), Ph.D., *Associate Professor of Physiology*
 Elwyn L. Simons (1977), Ph.D., D.Phil., *Professor of Anthropology and Professor of Anatomy*
 Ida Harper Simpson (1959), Ph.D., *Professor of Sociology*
 William R. Sizemore (1982), Ph.D., *Adjunct Professor of Forestry*
 Theodore Alan Slotkin (1971), Ph.D., *Professor of Pharmacology*
 Carol A. Smith (1974), Ph.D., *Associate Professor of Anthropology*
 Connie U. Smith (1980), Ph.D., *Assistant Professor of Computer Science*
 D. Moody Smith (1965), Ph.D., *Professor of New Testament Interpretation*

David A. Smith (1962), Ph.D., *Associate Professor of Mathematics*
Donald S. Smith II (1961), M.H.A., *Assistant Professor of Health Administration*
Grover C. Smith (1952), Ph.D., *Professor of English*
Harmon L. Smith (1959), Ph.D., *Professor of Moral Theology*
Joel Smith (1958), Ph.D., *Professor of Sociology*
Kathleen P. Smith (1980), Ph.D., *Assistant Professor of Anatomy*
Peter Smith (1959), Ph.D., *Professor of Chemistry*
Peter Guy Smith (1982), Ph.D., *Assistant Medical Research Professor of Pharmacology*
Ralph E. Smith (1970), Ph.D., *Professor of Virology*
Ralph Snyderman (1971), M.D., *Professor of Immunology*
George G. Somjen (1963), M.D., *Professor of Physiology and Lecturer in Psychology*
Joachim R. Sommer (1957), M.D., *Professor of Pathology*
Madison S. Spach (1958), M.D., *Professor of Physiology*
John R. Spencer (1978), Ph.D., *Professor of Art*
Thomas Arthur Spragens, Jr. (1967), Ph.D., *Professor of Political Science*
Carol B. Stack (1975), Ph.D., *Associate Professor of Public Policy Studies and Adjunct Associate Professor of Anthropology*
John E. R. Staddon (1967), Ph.D., *Professor of Psychology and Professor of Zoology*
Richard Staelin (1982), Ph.D., *T. Austin Finch Professor of Business Administration*
Dale O. Stahl II (1982), Ph.D., *Assistant Professor of Economics*
William J. Stambaugh (1961), Ph.D., *Professor of Forest Pathology*
Dennis Keith Stanley (1961), Ph.D., *Associate Professor of Classical Studies*
Charles Franklin Starmer, Jr. (1966), Ph.D., *Professor of Computer Science*
Deborah A. Steege (1977), Ph.D., *Assistant Professor of Biochemistry*
David Curtis Steinmetz (1971), Th.D., *Professor of Church History and Doctrine*
Daniel David Sternbach (1979), Ph.D., *Assistant Professor of Chemistry*
Philip Stewart (1972), Ph.D., *Professor of Romance Languages*
Donald E. Stone (1963), Ph.D., *Professor of Botany*
Boyd R. Strain (1969), Ph.D., *Professor of Botany*
Victor H. Strandberg (1966), Ph.D., *Associate Professor of English*
Harold Carl Strauss (1972), M.D., *Associate Professor of Pharmacology*
Howard Austin Strobel (1948), Ph.D., *Professor of Chemistry*
Richard J. Stull (1981), B.A., *Adjunct Professor of Health Administration*
Ish Sud (1977), Ph.D., *Adjunct Associate Professor of Mechanical Engineering*
J. Bolling Sullivan (1970), Ph.D., *Associate Professor of Biochemistry*
§John P. Sutherland (1969), Ph.D., *Associate Professor of Zoology*
Louis E. Swanson (1949), A.B., *Associate Professor of Health Administration*
James A. Swenberg (1979), D.V.M., Ph.D., *Adjunct Associate Professor of Pathology*
John Sylvester (1982), Ph.D., *Assistant Professor of Mathematics*
Avis L. Sylvia (1977), Ph.D., *Assistant Medical Research Professor of Physiology*
Charles Tanford (1960), Ph.D., *James B. Duke Professor of Physiology*
George E. Tauchen (1977), Ph.D., *Assistant Professor of Economics*
Kenneth Allen Taylor (1980), Ph.D., *Assistant Medical Research Professor of Anatomy*
John J. TePaske (1967), Ph.D., *Professor of History*
Marcel Tetel (1960), Ph.D., *Professor of Romance Languages*
Jean-Jacques Thomas (1981), Doctorat de 3e Cycle, *Associate Professor of Romance Languages*
Fredrick L. Thurstone (1967), Ph.D., *Professor of Biomedical Engineering*
Edward A. Tiryakian (1965), Ph.D., *Professor of Sociology*
R. Larry Todd (1978), Ph.D., *Associate Professor of Music*
Robert E. Toomey (1980), LL.D., *Adjunct Professor of Health Administration*
Edward Tower (1974), Ph.D., *Professor of Economics*
Vladimir G. Treinl (1967), Ph.D., *Professor of Economics*
Kishor S. Trivedi (1975), Ph.D., *Associate Professor of Computer Science and Associate Professor of Electrical Engineering*
Anne S. Tsui (1981), Ph.D., *Assistant Professor of Business Administration*
Vance Tucker (1964), Ph.D., *Professor of Zoology*
Lee E. Tyrey (1970), Ph.D., *Assistant Professor of Anatomy*
Senol Utku (1970), Sc.D., *Professor of Civil Engineering and Professor of Computer Science*
Marcy K. Uyenoyama (1982), Ph.D., *Assistant Professor of Zoology*
Arturo Valenzuela (1970), Ph.D., *Associate Professor of Political Science*
Thomas C. Vanaman (1970), Ph.D., *Professor of Microbiology and Immunology*
James H. Vander Weide (1972), Ph.D., *Professor of Business Administration*
J. Michael Vasievich (1977), Ph.D., *Adjunct Assistant Professor of Forest Economics*
James W. Vaupel (1972), Ph.D., *Associate Professor of Public Policy Studies and Associate Professor of Business Administration*
John M. Vernon (1966), Ph.D., *Professor of Economics*

§Sabbatical leave, January 1, 1983 through December 31, 1983.

P. Aarne Vesilind (1970), Ph.D., *Professor of Civil Engineering and Associate Professor of Environmental Studies*
 Elia E. Villanueva (1969), A.M., *Associate Professor of Physical Therapy*
 W. Kip Viscusi (1981), Ph.D., *Professor in Fuqua School of Business and Professor of Public Policy Studies*
 Osvaldo Humberto Viveros (1977), M.D., *Adjunct Associate Professor of Pharmacology*
 F. Stephen Vogel (1961), M.D., *Professor of Pathology*
 Steven Vogel (1966), Ph.D., *Professor of Zoology*
 Robin T. Vollmer (1975), M.D., *Assistant Clinical Professor of Pathology*
 Olaf T. von Ramm (1974), Ph.D., *Associate Professor of Biomedical Engineering*
 Robert A. Wagner (1978), Ph.D., *Associate Professor of Computer Science*
 Stephen A. Wainwright (1964), Ph.D., *Professor of Zoology*
 William D. Walker (1971), Ph.D., *Professor of Physics*
 Andrew G. Wallace (1964), Ph.D., *Professor of Physiology*
 Thomas Dudley Wallace (1974), Ph.D., *James B. Duke Professor of Economics*
 Lise Wallach (1970), Ph.D., *Lecturer in Psychology*
 Michael A. Wallach (1962-72; 1973), Ph.D., *Professor of Psychology*
 Edward L. Walls, Jr. (1981), Ph.D., *Adjunct Professor of Health Administration*
 Richard L. Walter (1962), Ph.D., *Professor of Physics*
 Paul P. Wang (1968), Ph.D., *Professor of Electrical Engineering*
 Calvin L. Ward (1952), Ph.D., *Professor of Zoology*
 Frances Ellen Ward (1969), Ph.D., *Professor of Immunology*
 Bruce W. Wardropper (1962), Ph.D., *William Hanes Wannamaker Professor of Romance Languages*
 D. Michael Warner (1975), M.H.A., Ph.D., *Associate Professor of Health Administration*
 Seth L. Warner (1955), Ph.D., *Professor of Mathematics*
 David Grant Warren (1975), J.D., *Professor of Health Administration*
 Thomas E. Wartenberg (1977), Ph.D., *Assistant Professor of Philosophy*
 Richard Lyness Watson, Jr. (1939), Ph.D., *Professor of History*
 Katharine Way (1968), Ph.D., *Adjunct Professor of Physics*
 Robert E. Webster (1970), Ph.D., *Professor of Biochemistry*
 Andrew S. Wechsler (1974), M.D., *Assistant Professor of Physiology*
 Eliot Roy Weintraub (1970), Ph.D., *Professor of Economics*
 Morris Weisfeld (1967), Ph.D., *Professor of Mathematics*
 Henry R. Weller (1978), Ph.D., *Professor of Physics*
 Robert P. Weller (1980), Ph.D., *Assistant Professor of Anthropology*
 Richard L. Wells (1962), Ph.D., *Professor of Chemistry*
 Robert W. Wheat (1958), Ph.D., *Professor of Microbiology and Assistant Professor of Biochemistry*
 Richard A. White (1963), Ph.D., *Professor of Botany*
 Richard Whorton (1979), Ph.D., *Assistant Professor of Pharmacology*
 Carol J. Wikstrand (1975), Ph.D., *Assistant Medical Research Professor of Pathology*
 Henry M. Wilbur (1973), Ph.D., *Professor of Zoology*
 Robert L. Wilbur (1957), Ph.D., *Professor of Botany*
 Pelham Wilder, Jr. (1949), Ph.D., *Professor of Chemistry and Professor of Pharmacology*
 Hilda Pope Willett (1948), Ph.D., *Professor of Bacteriology*
 George W. Williams (1957), Ph.D., *Professor of English*
 Kenny J. Williams (1977), Ph.D., *Professor of English*
 William Hailey Willis (1963), Ph.D., *Professor of Greek in Classical Studies*
 James F. Wilson (1967), Ph.D., *Professor of Civil Engineering*
 John Wilson (1968), D.Phil., *Associate Professor of Sociology*
 Steven P. Wilson (1982), Ph.D., *Assistant Medical Research Professor of Pharmacology*
 Thomas George Wilson (1959), Sc.D., *Professor of Electrical Engineering*
 Wilkie Andrew Wilson, Jr. (1974), Ph.D., *Associate Medical Research Professor of Pharmacology*
 Robert G. Winfree (1974), M.A., *Adjunct Assistant Professor of Health Administration*
 Cliff W. Wing, Jr. (1965), Ph.D., *Professor of Psychology*
 Orval S. Wintermute (1958), Ph.D., *Professor of Religion*
 Ronald Witt (1971), Ph.D., *Professor of History*
 Benjamin Wittels (1961), M.D., *Professor of Pathology*
 Myron L. Wolbarsht (1968), Ph.D., *Professor of Biomedical Engineering, Associate Professor of Physiology, and Lecturer in Psychology*
 Robert L. Wolpert (1976), Ph.D., *Assistant Professor of Mathematics*
 Peter H. Wood (1975), Ph.D., *Associate Professor of History*
 Max A. Woodbury (1966), Ph.D., *Professor of Computer Science*
 Christopher G. Wright (1980), Ph.D., *Assistant Professor of Mathematics*
 Donald Wright (1967), Ph.D., *Associate Professor of Mechanical Engineering*
 Duncan Yaggy (1980), Ph.D., *Professor of the Practice of Public Management in Public Policy Studies*
 William E. Yarger (1971), M.D., *Assistant Professor of Physiology*
 William P. Yohe (1958), Ph.D., *Professor of Economics*
 Charles R. Young (1954), Ph.D., *Professor of History*

Franklin W. Young (1944-50; 1968), Ph.D., *Amos Ragan Kearns Professor of New Testament and Patristic Studies*

John G. Younger (1974), Ph.D., *Associate Professor of Classical Studies*

Allen Zagarell (1980), Ph.D., *Assistant Professor of Anthropology*

Gary A. Zarkin (1982), Ph.D., *Assistant Professor of Economics*

Peter Zwadyk, Jr. (1971), Ph.D., *Associate Professor of Pathology*

Emeritus Professors

Francis Dorothy Acomb (1945), Ph.D., *Professor Emeritus of History*

John Richard Alden (1955), Ph.D., *James B. Duke Professor Emeritus of History*

Lewis Edward Anderson (1936), Ph.D., *Professor Emeritus of Botany*

Roger Fabian Anderson (1950), Ph.D., *Professor Emeritus of Entomology*

Frank Baker (1960), Ph.D., *Professor Emeritus of English Church History*

M. Margaret Ball (1963), Ph.D., *Professor Emeritus of Political Science*

Katharine May Banham (1946), Ph.D., *Associate Professor Emeritus of Psychology*

Joseph W. Beard (1937), M.D., *James B. Duke Professor Emeritus of Virology*

Frederick Bernheim (1930), Ph.D., *James B. Duke Professor Emeritus of Pharmacology*

Mary L. C. Bernheim (1930), Ph.D., *Professor Emeritus of Biochemistry*

William Dwight Billings (1952), Ph.D., *James B. Duke Professor Emeritus of Botany*

Cazlyn Green Bookhout (1935), Ph.D., *Professor Emeritus of Zoology*

Benjamin Boyce (1950), Ph.D., *James B. Duke Professor Emeritus of English*

Charles Kilgo Bradsher (1939), Ph.D., *James B. Duke Professor Emeritus of Chemistry*

Earl Ivan Brown II (1960), Ph.D., *J. A. Jones Professor Emeritus of Civil Engineering*

Frances Campbell Brown (1931), Ph.D., *Professor Emeritus of Chemistry*

Leonard Carlitz (1932), Ph.D., *James B. Duke Professor Emeritus of Mathematics*

William H. Cartwright (1951), Ph.D., *Professor Emeritus of Education*

Benjamin Guy Childs (1924), M.A., *Professor Emeritus of Education*

Robert Taylor Cole (1935), Ph.D., *James B. Duke Research Professor Emeritus of Political Science*

Robert Merle Colver (1953), Ed.D., *Associate Professor Emeritus of Education*

Norman Francis Conant (1935), Ph.D., *James B. Duke Professor Emeritus of Microbiology*

John S. Curtiss (1945), Ph.D., *James B. Duke Professor Emeritus of History*

Robert Earle Cushman (1945), Ph.D., *Research Professor Emeritus of Systematic Theology*

Bingham Dai (1943), Ph.D., *Professor Emeritus of Psychology*

William D. Davies (1966), D.D., F.B.A., *George Washington Ivey Professor Emeritus of Advanced Studies and Research in Christian Origins*

Gifford Davis (1930), Ph.D., *Professor Emeritus of Romance Languages*

Neal Dow (1934), Ph.D., *Professor Emeritus of Romance Languages*

Francis George Dressel (1929), Ph.D., *Professor Emeritus of Mathematics*

Kenneth Lindsay Duke (1940), Ph.D., *Associate Professor Emeritus of Anatomy*

Howard Easley (1930), Ph.D., *Associate Professor Emeritus of Education*

William Whitfield Elliott (1925), Ph.D., *Professor Emeritus of Mathematics*

John Wendell Everett (1932), Ph.D., *Professor Emeritus of Anatomy*

Wallace Fowlie (1964), Ph.D., *James B. Duke Professor Emeritus of Romance Languages*

Allan H. Gilbert (1920), Ph.D., *Professor Emeritus of English*

Clarence Gohdes (1930), Ph.D., *James B. Duke Professor Emeritus of English*

Walter Gordy (1946), Ph.D., *James B. Duke Professor Emeritus of Physics*

Paul M. Gross (1919), Ph.D., *William Howell Pegram Professor Emeritus of Chemistry*

Kazimierz Grzybowski (1967), S.J.D., *Professor Emeritus of Political Science*

Louise Hall (1931), Ph.D., *Professor Emeritus of Architecture*

John Hamilton Hallowell (1942), Ph.D., *James B. Duke Professor Emeritus of Political Science*

Jerome S. Harris (1936), M.D., *Professor Emeritus of Biochemistry*

William S. Heckscher (1966), Ph.D., *Benjamin N. Duke Professor Emeritus of Art*

Marcus Edwin Hobbs (1935), Ph.D., *University Distinguished Service Professor Emeritus of Chemistry*

Everett H. Hopkins (1961), M.A., LL.D., *Professor Emeritus of Education*

Wanda S. Hunter (1947), Ph.D., *Associate Professor Emeritus of Zoology*

Allan S. Hurlburt (1956), Ph.D., *Professor Emeritus of Education*

Marianna Jenkins (1948), Ph.D., *Professor Emeritus of Art*

Frederick C. Joerg (1947), M.B.A., *Professor Emeritus of Forest Management and Professor Emeritus of Business Administration*

Brady Rimbey Jordan (1927), Ph.D., *Professor Emeritus of Romance Languages*

Helen L. Kaiser (1943), R.P.T., *Professor Emeritus of Physical Therapy*

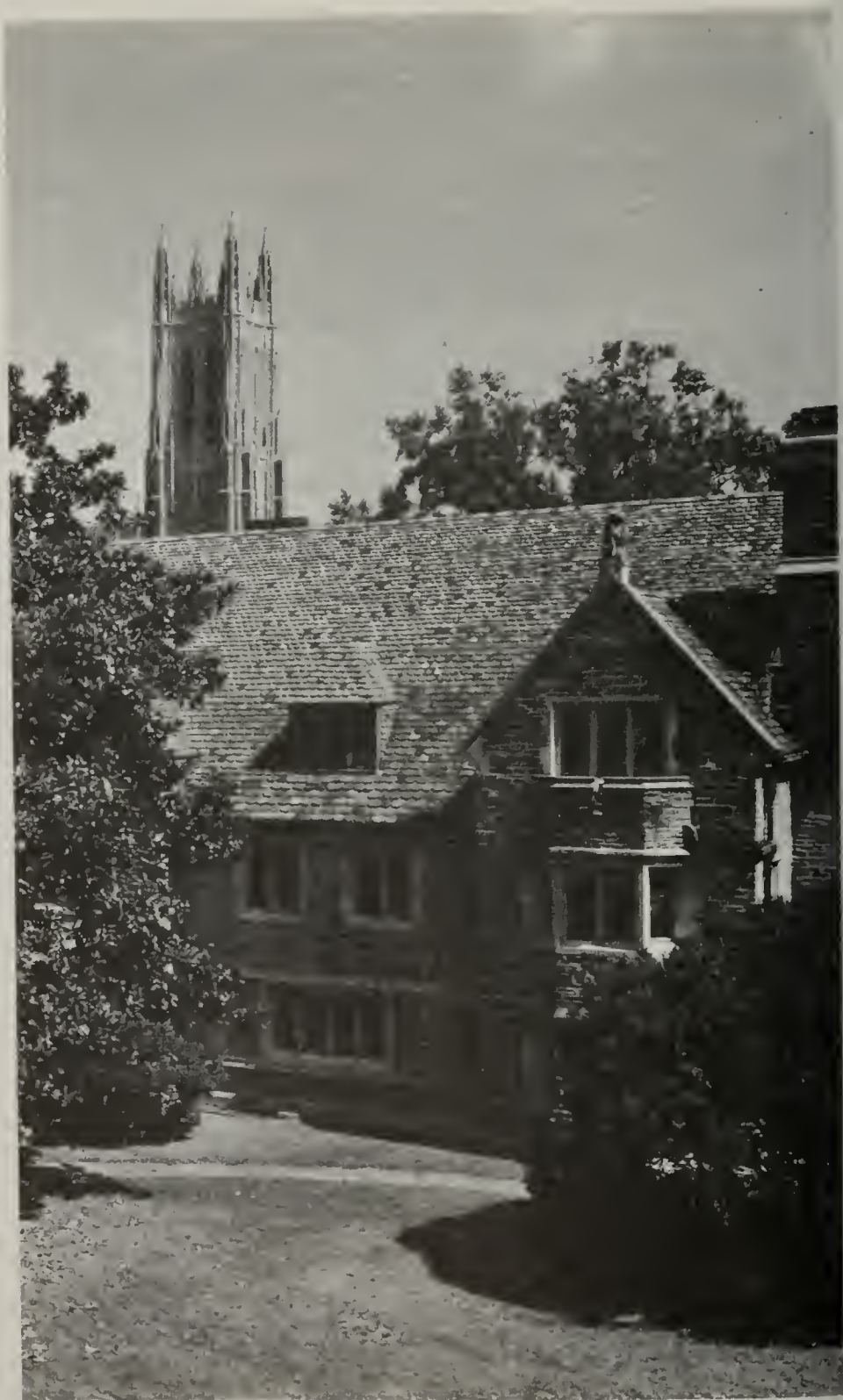
Van Leslie Kenyon, Jr. (1945), M.M.E., *Professor Emeritus of Mechanical Engineering and Materials Science*

Paul Jackson Kramer (1931), Ph.D., *James B. Duke Professor Emeritus of Botany*

Wladyslaw W. Kulski (1963), Ph.D., LL.D., *James B. Duke Professor Emeritus of Russian Affairs*

Weston LaBarre (1946), Ph.D., *James B. Duke Professor Emeritus of Anthropology*

Charles Earl Landon (1926), Ph.D., *Professor Emeritus of Economics*
 John L. Lievsay (1962), Ph.D., *James B. Duke Professor Emeritus of English*
 L. Sigfred Linderoth, Jr. (1965), M.E., *Professor Emeritus of Mechanical Engineering*
 John Nelson Macduff (1956), M.M.E., *Professor Emeritus of Mechanical Engineering*
 Alan Krebs Manchester (1929), Ph.D., *University Distinguished Service Professor Emeritus of History*
 Sidney David Markman (1947), Ph.D., *Professor Emeritus of Art History and Professor Emeritus of Archaeology*
 Earl George Mueller (1945), Ph.D., *Professor Emeritus of Art*
 Francis Joseph Murray (1960), Ph.D., *Professor Emeritus of Mathematics*
 Glenn Robert Negley (1946), Ph.D., *Professor Emeritus of Philosophy*
 James G. Osborne (1961), B.S., *Professor Emeritus of Forest Biometry*
 Harold Talbot Parker (1939), Ph.D., *Professor Emeritus of History*
 Lewis Patton (1926), Ph.D., *Professor Emeritus of English*
 Harold Sanford Perry (1932), Ph.D., *Professor Emeritus of Botany*
 Ray C. Petry (1937), Ph.D., LL.D., *James B. Duke Professor Emeritus of Church History*
 Olan Lee Petty (1952), Ph.D., *Professor Emeritus of Education*
 Richard Lionel Predmore (1950), D.M.L., *Professor Emeritus of Romance Languages*
 Richard A. Preston (1965), Ph.D., *William K. Boyd Professor Emeritus of History*
 Theodore Ropp (1938), Ph.D., *Professor Emeritus of History*
 Mabel F. Rudisill (1948), Ph.D., *Associate Professor Emeritus of Education*
 Herman Salinger (1955), Ph.D., *Professor Emeritus of Germanic Languages and Professor Emeritus of Comparative Literature*
 Charles Richard Sanders (1937), Ph.D., *Professor Emeritus of English*
 Lloyd Saville (1946), Ph.D., *Professor Emeritus of Economics*
 William H. Simpson (1930), Ph.D., *Professor Emeritus of Political Science*
 H. Shelton Smith (1931), Ph.D., *James B. Duke Professor Emeritus of American Religious Thought*
 Joseph John Spengler (1934), Ph.D., *James B. Duke Professor Emeritus of Economics*
 William Franklin Stinespring (1936), Ph.D., *Professor Emeritus of Old Testament and Semitics*
 W. A. Stumpf (1948), Ph.D., *Professor Emeritus of Education*
 Elizabeth Read Sunderland (1939-42; 1943), Ph.D., *Professor Emeritus of Art*
 Edgar Tristram Thompson (1935), Ph.D., *Professor Emeritus of Sociology*
 James Nardin Truesdale (1930), Ph.D., *Professor Emeritus of Greek*
 Richard L. Tuthill (1953), Ed.D., *Professor Emeritus of Economic Geography*
 Patrick R. Vincent (1954), Ph.D., *Associate Professor Emeritus of Romance Languages*
 Warren Chase Vosburgh (1928), Ph.D., *Professor Emeritus of Chemistry*
 Henry Weitz (1950), Ed.D., *Professor Emeritus of Education*
 Bruce A. Wells (1964), M.S.E.E., *Associate Professor Emeritus of Electrical Engineering*
 Paul Welsh (1948), Ph.D., *Professor Emeritus of Philosophy*
 Karl Milton Wilbur (1946), Ph.D., *James B. Duke Professor Emeritus of Zoology*
 Robert Hilliard Woody (1929), Ph.D., *Professor Emeritus of History*

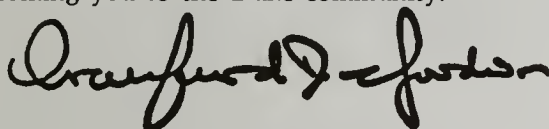


To the Prospective Graduate Student

From its beginning Duke University has maintained a first-rate Graduate School. This, we believe, is where excellence is established and where the two essential functions of a university, teaching and research, truly come together. Over the years Duke's strength at the graduate level has grown in all the main fields of knowledge. The faculty enjoys international distinction. The laboratories, libraries, and computer facilities are among the very best. Yet the Graduate School remains small enough so that personal contact is a central feature of our programs, and fruitful interaction across disciplines is a common experience.

We are confident that for the student in search of a fine graduate education Duke University has much to offer. This is a community in which minds and ideas grow. We provide training for many careers, but we seek also to stimulate personal creativity and to provide congenial surroundings in which education and research are both productive and pleasant.

We hope that the following pages will provide you with the information you require in making the important choice of the course of your graduate education, and we look forward to welcoming you to the Duke community.

A handwritten signature in black ink, reading "Craufurd D. Goodwin". The signature is fluid and cursive, with the first name "Craufurd" being more prominent and the last name "Goodwin" following in a similar style.

Craufurd D. Goodwin
Dean of the Graduate School

Program Information



Degrees Offered

The Graduate School of Duke University offers the following degrees: Master of Arts (A.M.), Master of Science (M.S.), Master of Health Administration (M.H.A.), and Doctor of Philosophy (Ph.D.).

The Master's Degrees

To be considered as a candidate for a master's degree (A.M., M.S., M.H.A.), the graduate student must (1) have made passing grades in the first 12 units of course work, (2) have made a grade of *G* or *E* on at least 3 units of this work, and (3) have received the approval of the major department.

MASTER OF ARTS

The Master of Arts degree may be earned either with or without presentation of a thesis according to the requirements of the individual program. Certain general requirements must be met in all programs, whether or not a thesis is presented.

Prerequisite. As a prerequisite to graduate study in the major subject, a student must have completed a minimum of 24 undergraduate semester hours—ordinarily 12 semester hours of approved college courses in the major subject and 12 additional semester hours in the major or in related work. Since some departments require more than 12 semester hours in the proposed field of study, students should read carefully the special requirements listed by their major departments, described in the chapter "Courses of Instruction" in this bulletin. If special master's degree requirements are not specified in this section and there is a question about the prerequisite, a prospective student should write directly to the appropriate Director of Graduate Studies.

Language Requirements. The Graduate School requires no foreign language for the master's degree. Certain departments, however, do have a foreign language requirement for their master's programs. Any such requirement must be satisfied before the master's examination is taken. See the departmental listings in the chapters "Courses of Instruction" and "Registration and Regulations."

Major and Related Subjects. The student must present acceptable grades for a minimum of 24 units of graduate courses. Of these, at least 12 units must be in the major subject. A minimum of 6 units must be in a minor subject or in related fields which are approved by the student's major department. The remaining 6

units of the required 24 may be taken in either the major or in related fields approved by the major department and by the Dean of the Graduate School. A maximum of 6 units may be earned either by submission of an approved thesis, or by completing courses or other academic activities approved by the student's department. Thirty units of graduate credit at Duke constitutes minimum enrollment for the Master of Arts degree.

MASTER OF SCIENCE

The degree of Master of Science is offered in various areas including the following: botany, chemistry, forestry, geology, pathology, physical therapy, statistics and computing, and four fields of engineering—biomedical, civil and environmental, electrical, and mechanical and materials science.

Prerequisite. A bachelor's degree is a prerequisite for the M.S. degree. Departments offering an M.S. degree consider for admission students from allied fields provided they have satisfactory scientific and mathematical backgrounds.

Language Requirement. There is no foreign language requirement in Master of Science degree programs.

Major and Related Subjects. The student must present acceptable grades for a minimum of 24 units of graduate courses. Of these, at least 12 units must be in the major subject. A minimum of 6 units must be in a minor subject or in related fields which are approved by the student's major department. The remaining 6 units of the required 24 may be taken in either the major or in related fields approved by the major department and by the Dean of the Graduate School. A maximum of 6 units may be earned either by submission of an approved thesis, or by completing courses or other academic activities approved by the student's department. Thirty units of graduate credit at Duke constitutes minimum enrollment for the Master of Science degree. Specific requirements vary according to the department. Please consult the chapter "Courses of Instruction" for departmental information.

MASTER OF HEALTH ADMINISTRATION

The Department of Health Administration offers a curriculum for graduate students interested in the field of health services management. It is designed primarily for students who hope to assume major leadership roles in a variety of organizations and programs that involve the provision of health services in public or private settings.

Prerequisite. Students with any undergraduate major may apply. Algebra at the college level is the only prerequisite, and a special course is available each summer for students whose preparation in mathematics is inadequate or out of date.

Other Degree Requirements. The Master of Health Administration program is designed around a core of courses in health services and management sciences, medical care, economics, quantitative decision making, law, and policy. The curriculum offers a wide range of elective courses including planning, financial management, personnel, organizational development and behavior, information management, and current topics in health administration. The academic program is five semesters in length, including a full semester during the summer. Upon completing the degree, a student without prior experience usually elects to take a nine-to twelve-month administrative residency during which a salary is received.

The Doctoral Degrees

DOCTOR OF PHILOSOPHY

The Ph.D. degree is a research degree. Although course work is a necessary part of the student's program, the mere accumulation of course credits will not be sufficient for attaining this degree. The granting of the Ph.D. degree is based primarily upon the student's knowledge of a specialized field of study and upon the production of an acceptable dissertation embodying the results of original research.

Requirements. The formal requirements for the Ph.D. degree are as follows: (1) major and related courses, (2) foreign language(s) in many departments, (3) a supervisory committee for the student's program of study, (4) residence, (5) preliminary examination, (6) dissertation, and (7) final examination. For details, see the chapter "Registration and Regulations."

Residence. The *minimum* full-time residence requirement is one academic year (two consecutive semesters in the same academic year) at Duke. The *minimum* registration requirement is 60 units of graduate credit, of which not more than 30 units of a completed master's degree may be accepted by transfer. The transfer of credit will not reduce the minimum requirement of one full-time academic year at Duke. (For the definition of residence, see the section on academic regulations in the chapter "Registration and Regulations.") Students who have completed the residency requirement will be permitted to reduce their registration to 3 units per semester after they have passed the preliminary examination. If there are undergraduate deficiencies in their programs, they may be required to take undergraduate courses for which they will not receive degree credit. Even if there are no such undergraduate deficiencies, the student's supervisory committee will determine what requirements above the minimum, if any, the student must meet.

Credit for Summer Work. Credit earned in the summer session will not reduce the minimum required residence. See the chapter "Registration and Regulations."

Special and Cooperative Programs



Center for the Study of Aging and Human Development

The primary aims of the center are to encourage and support basic and applied research on biomedical, behavioral, and social scientific aspects of adult development and aging; to train investigators for such research; to provide clinical training in geriatrics for health professionals; and to develop sources of scientific information which are accessible to interested individuals, organizations, and governmental agencies.

Although the center does not offer degrees, the varied programs, research laboratories, and clinical settings provide a context and resource for undergraduate and graduate students and for health professionals with special interests in adult development and aging. The center does conduct multidisciplinary, two-year programs for postdoctoral fellows interested in focused training for independent research on many varied aspects of aging and adult development. Through a program of seminars, collaboration with the senior fellows of the center, and independent research, postdoctoral fellows are able to choose and concentrate on selected issues of particular interest. Research methods, the development of specific research skills, and an interdisciplinary perspective are stressed. Resources of this all-University program include data from two longitudinal studies, a wide range of archival data of special interest to social scientists, an animal colony, and the center's basic and applied research laboratories. Undergraduate and graduate students of the University are welcome to inquire about participation in all programs at the center. A division of geriatrics coordinates research, training, and services related to the care of older adults.

Access to the faculties of medicine and arts and sciences is facilitated by a tradition of multidisciplinary research and a central location on campus. Inquiries should be addressed to the Director, Duke University Center for the Study of Aging and Human Development, Box 3003, Duke University Medical Center, Durham, North Carolina 27710.

Asian-Pacific Studies Institute

The purpose of the Asian-Pacific Studies Institute is to encourage and support advanced training in Asian-Pacific studies and in Chinese, Japanese, and eventually other Asian-Pacific languages. Fellowships provide both tuition and a living stipend up to the James B. Duke award amounts for a two-year period. Fellows will be expected to reach the equivalent of third-year level of proficiency of language training during the term of the award. Incoming graduate students with the Ph.D. as their objective, students in good standing in the first year of study in

Duke professional schools, and current Duke students enrolled in Ph.D. programs may be considered for Asian-Pacific Studies Institute Fellowships. Further information may be obtained from the Director, Asian-Pacific Studies Institute, 2101 Campus Drive, Duke University, Durham, North Carolina 27706.

Canadian Studies Program

The Canadian Studies Program was inaugurated in September, 1973. It is supported in part by grants from the Office of Education of the U.S. Department of Education, the Andrew W. Mellon Foundation, and Canadian governments. Its purpose is to formalize and expand the interest of graduate students in Canada, to introduce the study of Canadian life and culture at the undergraduate level, and to encourage such study in primary and secondary schools. The program's basic aim is to increase knowledge and understanding of Canada at Duke, in North Carolina, and in other southern states.

The program awards a limited number of graduate fellowships and teaching assistantships for the study of Canada by American residents at Duke who are working in their departments on a Canadian topic for their dissertations. Grants of travel aid for field research in Canada are also offered.

The program sponsors lectures by Canadian specialists on campus and supports seminars devoted to Canada off and on campus. Opportunities for study in Alberta and Quebec are offered to graduate students and faculty.

Inquiries should be addressed to the Director of Canadian Studies, Center for International Studies, 2122 Campus Drive, Duke University, Durham, North Carolina 27706.

The University Program in Cell and Molecular Biology

This program centralizes the cell, developmental, and molecular biology research training found in eight of the University's departments: anatomy, biochemistry, botany, microbiology and immunology, pathology, pharmacology, physiology, and zoology. Prospective students may either apply to one of the participating departments, or apply directly to the program and designate a departmental preference. Applications for admission and fellowship support must be received by February 1, but early applications may receive earlier consideration.

Inquiries should be addressed to Dr. Bernard Kaufman, The University Program in Cell and Molecular Biology, Box 3711, Duke University Medical Center, Durham, North Carolina 27710.

Continuing Education

Local adult residents are invited to apply for admission to pursue graduate study at Duke as nondegree students through the Office of Continuing Education, which will provide both academic and career counseling to such students. Information and continuing education applications may be obtained from the Office of Continuing Education, 107 Bivins Building, Duke University, Durham, North Carolina 27708. (See the chapter "Admission.")

Cooperative Programs with Neighboring Universities

Interchange of Registration. (See the chapter "Registration and Regulations" for reciprocal agreements with neighboring universities.)

Library Exchange. Through a cooperative lending program, graduate students of the University of North Carolina and Duke University are granted loan privileges in both universities.

Cooperative Program in Russian and East European Studies. The graduate schools of Duke University and the University of North Carolina offer a cooperative program leading to the A.M. and Ph.D. degrees in several disciplines (economics, history, literature, linguistics, political science, and sociology), with a concentration in Russian and East European studies. Students admitted to one institution are encouraged to enroll in courses advantageous to their programs at the other institution, and to utilize the libraries and facilities of both universities. The holdings of the two libraries in Russian and East European materials are substantial and complementary. Both libraries have a policy of purchasing all significant published works in Slavic history, economics, government, geography, literature, and linguistics. Other joint activities include periodic colloquia involving the personnel of the two institutions and distinguished visiting scholars.

A research program in Soviet economics (with special subjects such as input-output analysis and the "second economy") provides special training for graduate students in this field and publishes a series of monographs under several private foundation and government grants.

For more information, contact Professor Vladimir G. Treml, Department of Economics, Duke University, Durham, North Carolina 27706.

Center for Demographic Studies

The Population Studies Program was established at Duke University in 1963 to promote research and training in demography and human ecology. The program was renamed the Center for Demographic Studies in 1972 in recognition of its broad multidisciplinary focus and expanded research program. The facilities of the center, located at 2117 Campus Drive, include a population library, the Joseph J. Spengler Collection of publications and research materials, and extensive data resources. These are available to the entire Duke community.

The center does not offer degrees; it promotes the pursuit of advanced degrees, with a specialization in population studies, through either the Department of Sociology or the Department of Economics. The center's program provides opportunities for direct student participation in ongoing research projects. The program of extramural research stresses, but is not limited to, applied work in the demography of aging, health, mortality, fertility, and migration.

Inquiries for training opportunities may be directed to Dr. George C. Myers, Director, Center for Demographic Studies, Box 4732 Duke Station, Durham, North Carolina 27706.

Center for Environmental Engineering

The purposes of the Center for Environmental Engineering are to focus attention on pressing environmental problems, to provide orientation and educational opportunities in technical environmental subjects for both students and faculty, and to promote interdisciplinary environmental engineering research. The center sponsors a visiting speaker program, graduate and faculty seminars, and coordinates graduate and undergraduate courses in environmental engineering. Further information may be obtained by writing or visiting the Center for Environmental Engineering Office, 118 School of Engineering, Duke University, Durham, North Carolina 27706.

The University Program in Genetics

The University Program in Genetics was established to provide for the coherent development of instruction and research in genetics throughout the University. The faculty of the program consists of scientists holding primary

appointments in several of the biological science departments (anatomy, biochemistry, botany, microbiology and immunology, zoology.) They have developed an interdepartmental graduate curriculum designed to meet the needs of students with a variety of educational backgrounds and professional objectives. Students in any of the member departments may specialize in the discipline of genetics under the auspices of the University Program in Genetics. Interested students should apply for admission to the department of their choice, and after being admitted make arrangements to participate in the program.

For current information consult Professor N. W. Gillham, Director, The University Program in Genetics, 0082 Biological Sciences Building, Duke University, Durham, North Carolina 27706.

Master of Arts Program in Humanities

This interdepartmental program centered in the humanities and leading to the A.M. degree is designed for students whose interests cross disciplinary lines and are not easily met by departmental programs. Students select a set of thematically related courses from the graduate level offerings of humanities departments, and, where appropriate, from other departments as well. The interdepartmental committee which manages the program offers aid in tailoring a set of courses to the individual student's needs, approves the program chosen, and provides ongoing supervision. In addition, an introductory noncredit seminar, "Humanities as Ways of Knowing," is planned as a shared experience for all students in the program.

Information on program requirements and admission may be found in the chapter "Courses of Instruction." Additional information may be obtained by writing Professor Peter Burian, Director, Master of Arts Program in Humanities, 328 Carr Building, Duke University, Durham, North Carolina 27708.

Indian Ocean Studies Program

Indian Ocean studies is a newly established program at Duke. Its purpose is to encourage both scholarly research and graduate training on the political, historical, economic, and sociocultural development of the countries of the region. The Indian Ocean region is defined as the littoral and island countries of South and East Africa, the Arabian peninsula and Persian Gulf, South and Southeast Asia, and Australia. The program also concerns itself with a number of adjacent countries which do not have coastlines directly on the Indian Ocean. The focus is upon this extensive area as a zone of intense human interaction, the impetus for which may have emerged from forces internal to cultures and societies within the region, or from the intrusion of external forces such as western colonialism and, more recently, military and economic power.

The program tries to encourage and to coordinate systematic training for graduate students in the culture, society, histories, and economies of the various countries and/or areas within the Indian Ocean world. Graduate students may also pursue comparative interests and themes (e.g., economic development, nationalism) through all or part of the region. The Departments of History, Anthropology, Political Science, Religion, Music, Sociology, and Civil and Environmental Engineering, among others, actively cooperate with the program.

Graduate students, in addition to meeting the requirements of the departments in which they are enrolled, are expected to take Hindi, Persian, Swahili, Arabic, or another Indian Ocean language appropriate to their research. Generally, field research which involves residence in an Indian Ocean country is expected for completion of the dissertation.

The University offers predoctoral graduate fellowships through the participating departments. Foreign students may be eligible to compete for two James B. Duke International Studies Fellowships awarded each year.

Through the Indian Ocean Studies Program the University supports and facilitates research by faculty and graduate students affiliated with the program. Research grants are also available from such organizations as the American Institute of Indian Studies to which the University belongs. Library holdings for study and research on Indian Ocean countries are especially strong.

The program sponsors a regular agenda of visiting speakers and scholarly presentations in its faculty/graduate student seminar, in addition to special research symposia and conferences.

Inquiries should be addressed to the Chairman, Indian Ocean Studies Program, Center for International Studies, 2122 Campus Drive, Duke University, Durham, North Carolina 27706.

Duke University International House

The International House is the focal point for social and cultural programs planned especially for and by foreign students. It is a meeting place for all internationals studying or working at the University. An orientation to Duke and the Durham community is held prior to the start of classes each fall semester.

Some of the programs sponsored by the International House include: the International Association, which consists of American and foreign students organized to foster mutual understanding among the students and staff from all nations represented in the Duke community through cultural and recreational activities; the Host Family Program, which offers all students the chance to become acquainted with an American family; the International Wives Club, which provides a structure for international women to meet with American women in an informal atmosphere; and the Speakers' Bureau, which provides an opportunity for internationals to share their cultures and customs with members of the Durham community through speaking engagements at city school classes, civic organizations, and social clubs.

The programs, available to all international visitors, facilitate intercultural communication and provide a means for easy acculturation into American society. Inquiries should be directed to Jean D. Wilbur, Director, International House, 2022 Campus Drive, Duke University, Durham, North Carolina 27706.

Islamic and Arabian Development Studies

A program in Islamic and Arabian Development Studies was established in 1977 with the assistance of grants from the government of Saudi Arabia and some twenty corporations in the United States. The program sponsors research on Islamic themes with special reference to developmental problems of the Arabian peninsula and supports an undergraduate course in Islamic civilization and a senior-graduate seminar in contemporary problems of the Islamic world. In 1979 the program sponsored an international conference at Duke and in 1982 held a second international conference on Kiawah Island, South Carolina. Smaller conferences are held at Duke from time to time: in 1982 there was a conference on security problems of the Arabian peninsula and a seminar in calligraphy, illumination, and art of the *Qur'an*.

The program provides a limited number of graduate fellowships and supports the teaching of three years of Arabic and a course in contemporary Arab literature in translation. It also sponsors an outreach program which includes Appalachian State University, Belmont Abbey College, the College of Charleston, Converse College, Davidson College, Johnson C. Smith University, Old Dominion University, and the University of the South. A summer program for college teachers was also conducted in 1981.

Inquiries should be addressed to Dr. Ralph Braibanti, Director, Islamic and Arabian Development Studies, 2114 Campus Drive, Duke University, Durham, North Carolina 27706.

Latin-American Studies Program

The Graduate School offers an interdepartmental program in Latin-American studies leading to the A.M. and Ph.D. degrees. Students may write their theses and take their degrees in anthropology, history, economics, political science, sociology, or Romance languages and literature. The purpose of the program is to provide a desirable combination of courses on Ibero-America in these disciplines and to give candidates more rigorous training in Latin-American studies. In consultation with the candidate, a faculty committee will determine a special program of study.

The holdings of the Perkins Library for graduate work and research in Ibero-American history, inter-American relations, economic history, politics, art, and Spanish-American literature are constantly being enlarged. Program faculty are involved in different national research programs dealing with Ibero-American topics and offer advice on fellowship support for graduate research in Latin America and the Caribbean. Inquiries should be directed to Dr. Arturo A. Valenzuela, Chairman, Council on Latin-American Studies, Center for International Studies, 2101 Campus Drive, Duke University, Durham, North Carolina 27706.

The Ph.D. Program in Literature

The Ph.D. Program in Literature offers to qualified students the possibility of gaining unusually broad credentials with which to embark on a teaching career in established national literatures as well as programs linking literature to other fields. Study in depth through courses in a single national literature is combined with a series of four core courses, given in a two-year sequence, on the fundamental issues of literary theory, history, and criticism. The two-year program of courses is given focus and depth by a careful and continuous advising system, and by a tutorial requirement which prepares students in the skills and habits of advanced research. Normally, a student entering the program will work out a coherent but modifiable personal sequence of courses with a single general field of study in mind, e.g., the Renaissance, romanticism, tragedy, modern transformations of mythology, etc. These courses will be centered in a single national literature but students will be encouraged to explore a second or third national literature or related discipline in the humanities, such as philosophy or art history. All the literature departments cooperate in this program and its students have access to all courses given under the auspices of the graduate faculties in the humanities.

The program is managed by a committee which advises students, directs their course of study, and prepares their preliminary examinations in cooperation with the department of the national literature elected for primary study by program participants. A faculty of seventeen, drawn from all literature departments, is involved in the teaching of the program's core courses, which deploy the team-teaching method in order to make full use of faculty expertise.

Financial aid is available for qualified students in their first two years. In the third year all students will receive the opportunity to teach either English composition or elementary language instruction with the department of their chosen national literature. A full descriptive brochure is available. To obtain the brochure or other information, please direct all inquiries to Professor James Rolleston, Chairman, Committee for the Ph.D. in Literature, Department of Germanic Languages and Literature, 105 Language Building, Duke University, Durham, North Carolina 27706.

Medical Historian Training Program

The Medical Historian Training Program is conducted under the auspices of the School of Medicine and the Graduate School. The M.D.-Ph.D. program requires a minimum of six years of graduate study, and the M.D.-A.M. four or five years, depending on the use of summer terms. The M.D.-Ph.D. program is intended for those students who know that their major career effort will be in teaching and other scholarly activities in the history of medicine (not necessarily to the total exclusion of clinical medicine). The M.D.-A.M., on the other hand, is appropriate for those who are undecided, but who wish to acquire a firm foundation for future study. It is also appropriate for those who are seriously interested in pursuing an avocation in the history of medicine. In both programs the first two years and the last year will be spent in the medical school. All requirements for the Ph.D. and the A.M. must be completed before the final year of the M.D. program.

Application and Admission Procedures. Applicants must meet the requirements for admission to the School of Medicine and the Graduate School in the Department of History. Candidates who have completed two years of medical school will also be considered.

In addition to the minimum requirements established by the School of Medicine and the Graduate School, courses already taken in history and the history and philosophy of science will count in the selection of candidates. Those candidates holding the M.D. degree are accepted for the Ph.D. and the A.M. degrees.

Applicants should complete and submit an application to the Graduate School for admission to the Department of History.

Additional information may be obtained by writing to Dr. John Crellin, Director, Medical Historian Training Program, Box 3702, Duke University Medical Center, Durham, North Carolina 27710.

Medical Scientist Training Program

The Medical Scientist Training Program, conducted under the auspices of the Graduate School and the School of Medicine, is designed for students with a strong background in science who are motivated toward a career in the medical sciences and academic medicine. It provides an opportunity to integrate graduate education in one of the sciences basic to medicine with the clinical curriculum of the School of Medicine. The program usually requires six to seven years of study and leads to both the M.D. and Ph.D. degrees. Although the special emphasis of this program is on basic medical science, the trainees, because of their education in clinical medicine, have a remarkable range of career opportunities open to them. Graduates of this program generally follow one of two broad paths. Some directly pursue careers in teaching and research in one of the basic medical sciences, while maintaining strong ties with clinical science as a result of their combined training; others enter residency programs before pursuing investigative and teaching careers in clinical medicine, carrying with them strong academic backgrounds in the basic sciences.

Eligibility. Applicants must meet the admission requirements of both the Graduate School as a candidate for the Ph.D. degree and the School of Medicine as a candidate for the M.D. degree. Most candidates apply for admission to the first year of the program, but applications are accepted from students who are enrolled in appropriate stages of their curriculum in the Graduate School or School of Medicine of Duke University. In addition to the minimum requirements for acceptance in the Graduate School and the School of Medicine, advanced course

work in science and mathematics as well as prior research experience count heavily in the selection of candidates.

Financial Support. Students admitted to the first year of the program in 1983 can receive a traineeship award, consisting of a stipend and full tuition allowance, provided by a grant from the National Institutes of Health. The present annual stipend is \$5,040. Current policy of the National Institutes of Health limits the duration of the traineeship to six years, but may permit extensions under special circumstances; support will be continued for that period (or until the completion of both degrees, if earlier), provided that progress remains satisfactory. This traineeship, created by the National Research Service Award Act of 1974 (PL 93-348) provides (as do all research training awards under this act) for certain alternate service or payback requirements in the event that a research career is not pursued. Support by the NIH under the National Research Service Award Act requires the recipient to be a citizen or resident of the United States.

The Training Program. This program has been designed to offer trainees latitude in the selection of course material. Basic requirements are two academic years composed of the first basic science year and the second clinical science year of the curriculum for medical students at Duke University. Following completion of the second year, the trainee enters the graduate program to complete the requirements for the Ph.D. degree. A final academic year of elective clinical study is necessary to complete the requirements for the M.D. degree. Both degrees are awarded at the completion of this sequence.

Additional information may be obtained by writing Professor Henry Kamin, Associate Director, Medical Scientist Training Program, Department of Biochemistry, Box 3711, Duke University Medical Center, Durham, North Carolina 27710.

Program in Medieval and Renaissance Studies

The graduate Program in Medieval and Renaissance Studies is administered by the Duke University Center for Medieval and Renaissance Studies. A participating student is based in one of the regular departments and fulfills the Ph.D. degree requirements for that discipline. In addition, students take a program of electives which will advance their interdisciplinary competence in the medieval or Renaissance areas. Such a program may include a choice from the fields of art history, language and literature, history, philosophy, and religion. Participation in the Program in Medieval and Renaissance Studies will fulfill the requirement for work in a related field.

The Center for Medieval and Renaissance Studies awards annual fellowships to outstanding doctoral students. Each fellowship is renewable twice, with renewal based on a review of the student's program by a committee.

The Center for Medieval and Renaissance Studies also sponsors an undergraduate program, the *Journal of Medieval and Renaissance Studies*, a monograph series in the field, and lectures by distinguished visiting scholars.

Inquiries should be addressed to the Director of Graduate Studies, Duke University Center for Medieval and Renaissance Studies, Box 4666, Duke Station, Durham, North Carolina 27706.

The University Program in Neurobiology

Recent advances in neurobiology have resulted in such new methods as immunohistochemistry and in closer ties among the various approaches to studying the nervous system. For example, research on the neuroanatomical basis of behavior is more dependent than ever before on the chemical and cellular study of neurons. To keep pace with these changes a new program has been designed for

a small number of students who wish to study the nervous system at several levels ranging from the molecular to the behavioral. In planning course work, each student will be guided by an advisory committee whose members come from a variety of departments. All students will be advised to take courses in neuroanatomy, neurophysiology, neuropharmacology, and neuropsychology. The heart of the training is a research apprenticeship that leads to a Ph.D. dissertation. Each student must affiliate with one of the participating departments—anatomy, biochemistry, microbiology and immunology, pathology, pharmacology, physiology, psychology, and zoology—and must meet all the requirements of that department for the Ph.D. degree. Normally, the dissertation adviser and the student will be members of the same department.

Prospective students may apply directly to the University Program in Neurobiology or to one of the eight participating departments. Those who apply to the program should designate the department of choice. Those who apply to the department should indicate their interest in the University Program in Neurobiology. Applicants will be selected on the basis of their overall academic excellence, their promise for research, and their proficiency in the biological, behavioral, and physical sciences. Applications for admission and fellowship support must be received by February 1.

Inquiries should be directed to Professor Irving T. Diamond, Director, University Program in Neurobiology, Department of Psychology, Duke University, Durham, North Carolina 27706.

Oak Ridge Associated Universities

Duke University is one of the sponsoring universities of the Oak Ridge Associated Universities located at Oak Ridge, Tennessee. The graduate research program at Duke has available to it all the facilities of the Oak Ridge National Laboratory and the cooperative supervision of student research by the staff at Oak Ridge. Fellowships in several fields of science are available to qualified applicants.

Graduate Fellowship Program. On application by a university, ORAU awards fellowships to candidates for the master's and doctor's degrees. The student uses the fellowship to conduct thesis research in certain federal laboratories.

The application deadlines depend upon the fellowship. Further information may be obtained from Dr. Harold W. Lewis, Department of Physics, Duke University, Durham, North Carolina 27706.

Institute of Policy Sciences and Public Affairs

The graduate program in public policy studies is offered through the Institute of Policy Sciences and Public Affairs. The objective of the program is to prepare students for public sector jobs which require analytical skills and a practical understanding of the process by which policy is made and implemented.

The A.M. degree requires two academic years and a summer internship. The first year is devoted to core courses in policy analysis, including sequences in quantitative methods, economics, political analysis, and ethics. The summer internship normally is arranged with a federal or state agency. The second-year curriculum includes course work in public management, a concentration in a substantive policy area, and a masters "memo" to be researched and written on a problem of current policy concern.

Students who are concurrently enrolled in a Ph.D. program or a professional degree program (M.D., J.D., M.B.A., M.H.A., etc.) or who have already completed such a program can apply for an abbreviated version of the A.M. program. Such students are excused from all the requirements of the second year except for the

masters memo, so ordinarily, completing the A.M. requirements adds only one year to their graduate programs. Students usually apply for a joint degree program simultaneously with their applications to the graduate departments or professional schools, or during their first or second year of advanced study.

The institute does not award a Ph.D.

Additional information concerning the A.M. programs can be obtained by writing the Director of Graduate Studies, Institute of Policy Sciences and Public Affairs, Duke University, Durham, North Carolina 27706.

Center for Resource and Environmental Policy Research

The Center for Resource and Environmental Policy Research at Duke University is a commitment to the study of public policies on natural resources and the environment. Housed in the School of Forestry and Environmental Studies and initially supported by the Andrew W. Mellon Foundation, the center combines the efforts of a small permanent faculty with participation by business leaders, government officials, and the faculty and students of Duke University and other universities to provide a center of excellence for the analysis of contemporary resource and environmental policy issues. The center offers a forum for the examination of public and private responsibilities for natural resources and the environment and provides a means to link the specialized knowledge of academia with the information needs of government and industry.

Graduate research assistantships are offered to qualified students researching resource and environmental policy problems. Support is available to students pursuing M.S., A.M., or Ph.D. degrees through the Graduate School at Duke University and in conjunction with the School of Forestry and Environmental Studies or other departments. Course work is offered in both intensive and semester-long formats. Intensive courses lasting from one to three weeks are designed primarily for midcareer professionals seeking supplementary course work, certificates of achievement, or advanced degrees. Semester-long courses at the center are designed primarily for full-time students desiring a strong conceptual foundation in resource and environmental policy analysis.

For further information, write to Dr. William F. Hyde, Director of Graduate Studies, Center for Resource and Environmental Policy Research, 102 Biological Sciences Building, Duke University, Durham, North Carolina 27706.

Short Courses and Conferences

Short courses, institutes, and training programs are conducted throughout the year by the Office of Continuing Education. Some are residential, others are designed for local participants; some carry academic credit, others award continuing education units (CEU); still others are noncredit. Previous programs have included Federal Regulations, Writers' Conferences, Energy Conservation in Buildings, School Management, Product Safety, the Computer Camp, and the Summer Institute of Alcohol Studies. Contact Dr. Jean O'Barr, Director, Office of Continuing Education, 107 Bivins Building, Duke University, Durham, North Carolina 27708, for brochures describing current offerings and for assistance in developing programs.

Duke Summer Festival of Creative Arts—Artsfare '83

The Duke Summer Festival of Creative Arts is a part of the Summer Session and an extension of the function of the Office of Cultural Affairs, coordinating the arts in the summer and providing an exciting, artistically stimulating environment for the campus and community. During the summer, it is possible to offer new and

innovative courses and workshops. Distinguished artists and scholars will be involved in class and cocurricular sessions. Students will have opportunities to try their wings in formal and informal productions.

The range of fees and other information may be obtained by writing Summer Session, Duke University, Durham, North Carolina 27706.

Summer Drama Program. The Duke University Drama Program, which began its course offerings in the summer of 1974, strives to make its summer offerings particularly exciting and innovative. The undergraduate course offerings and the production program of Summer Theatre at Duke offer the theater-oriented student an integrated program of training in practical theater and dramatic literature during the second summer term.

Detailed information on faculty, courses, productions, and auditions may be obtained by writing to Summer Drama Program, Duke University, Box 6936 College Station, Durham, North Carolina 27708.

Summer Theatre at Duke. Founded in 1972, Summer Theatre at Duke has become an eagerly awaited series of exciting theatrical events. The repertory is chosen from the best in modern theater and musical comedy with an occasional new look at a classic. The casts are selected on the basis of auditions held during late spring. Four professional guest artists will headline casts of student and local talent. Direction and design are provided by the professional staff of the Duke University Drama Program.

For its twelfth season, Summer Theatre at Duke will offer four major productions and several special events during June and July, 1983. The repertory and ticket information will be announced in late spring.

For further information, write to Summer Theatre, Duke University, Box 6936 College Station, Durham, North Carolina 27708.

The American Dance Festival. The six-week program offers a wide variety of classes, performances, and workshops. For information, write to the American Dance Festival, Duke University, Box 6097 College Station, Durham, North Carolina 27708.

Special Programs for Teachers of Science and Mathematics

It is anticipated that the summer session will again offer special programs at the graduate level designed specifically for secondary school teachers of science and mathematics. For detailed information on the programs, teachers should write Dr. Pelham Wilder, Jr., Department of Chemistry, Duke University, Durham, North Carolina 27706.

The University Program in Toxicology

This interdepartmental program provides graduate students and postdoctoral fellows an opportunity for a strong interdisciplinary education in toxicology through support of courses, seminars, and research. With recognition of the impact of toxic reactions on the public health and ecological systems, toxicology is of increasing significance to public policy areas. The objectives of program members are to understand and devise controls for those toxicological phenomena having direct pertinence to human life and health, to train scholars who will advance the science of this discipline, and to provide a forum for faculty and student discussion of recent research developments in the area.

The faculty of the toxicology program is drawn from anatomy, biochemistry, chemistry, forestry and environmental studies, microbiology and immunology,



pathology, pharmacology, physiology, zoology, and several departments in the School of Medicine. Current areas of research include pulmonary toxicology, neurotoxicology, immunotoxicology, carcinogenesis, and biochemical toxicology. Students may base their training in general toxicology, ecotoxicology, or in any area in which the faculty is currently involved. Prospective graduate students may apply to the program directly or to one of the participating Graduate School departments, and must be admitted to the department and to the program.

Students will be expected to fulfill departmental Ph.D. degree requirements as well as toxicology program requirements.

Information on fellowship support and application procedures may be obtained from Dr. William S. Lynn, Director, University Program in Toxicology, Box 3711, Duke University Medical Center, Durham, North Carolina 27710.

Organization for Tropical Studies

Duke University is a member of an international consortium created to promote an understanding of tropical environments through research and research training programs in the tropics. The basic OTS course, Tropical Biology: An Ecological Approach (8 units), extends for an eight-week period in January-February and in July-August. Advanced offerings are scheduled periodically in agriculture, anthropology, botany, earth sciences, forestry, geography, marine biology, meteorology, and zoology.

The course schedules and application deadlines vary from year to year. Fellowship applications for travel and subsistence in the field-oriented programs conducted primarily in Costa Rica are available through the faculty representatives. Consult Dr. Donald Stone (botany), Dr. Richard White (botany), or Dr. Kenneth Glander (anthropology) for information.

Resources for Study



The Libraries

The libraries of the University consist of the William R. Perkins Library and its seven branches on campus—Biology-Forestry, Chemistry, Divinity, East Campus, Engineering, Music, and Physics-Math; the Undergraduate Library; the Pearce Memorial Library at the Duke Marine Laboratory in Beaufort; the Fuqua School of Business Library; the School of Law Library; and the Medical Center Library. In June 1982, these libraries contained approximately 3,218,000 volumes and ranked nineteenth in size among academic libraries in the United States. Approximately 10,300 periodicals, 11,300 serials, and 166 newspapers are received regularly. The collection includes about 7,450,000 manuscripts, 82,000 maps, 39,000 music scores, and 651,000 items in microform.

In addition to noteworthy holdings in British history, English literature, American history and literature, Commonwealth studies, Latin American history, religion, and science, the libraries include several distinguished special collections of international reputation such as the George Washington Flowers Collection of Southern Americana, the Baker Collection of Wesleyana and British Methodistica, the Mazzone Collection of Italian Literature, the Perez de Velasco Collection of Latin American History, the Jantz Collection of German Baroque Literature and German Americana, the Trent Collection of Walt Whitman, the Trent Collection in the History of Medicine, and the Strisower Collection of International Law.

THE WILLIAM R. PERKINS LIBRARY

Collections. The William R. Perkins Library, the main library of the University, houses most of the books and journals in the humanities and social sciences, large files of United States federal and state documents, public documents of many European and Latin American countries, publications of European academies and learned societies, and special collections from South Asian, Far Eastern, and Slavic countries. The newspaper collection, with 46,644 reels of microfilm and several thousand bound volumes, has long eighteenth-century files; strong holdings of nineteenth-century New England papers; antebellum and Civil War papers of North Carolina, South Carolina, and Virginia; and many European and Latin American papers. The manuscript collection of approximately 7,450,000 items is particularly strong in all phases of the history, politics, and social and economic life of the South Atlantic region and includes significant papers in English and American literature. The collection in the Rare Book Room contains scarce and valuable materials covering a broad range of fields. The Latin and Greek manuscript collection constitutes one of the outstanding groups of its kind in the United States. The collection of Confederate imprints is the largest in the country.

The branch libraries serve the academic disciplines bearing their names. The East Campus Library is primarily for undergraduate use; however, it also contains the principal collections for graduate and undergraduate study in art.

Control Desk. To protect the collections of Perkins Library for the benefit of all members of the University community, an electronic security system is in operation at the main exit. Desk attendants are stationed at the library's principal exit and are authorized to examine all books and other library materials that people leaving the library may be carrying in hands, briefcases, or bags to determine if they are properly charged. Anyone who refuses to permit books to be examined may be denied further use of the library.

Library Carrels. A limited number of closed and open carrels are available in the various libraries. Assignments ordinarily are made for the academic year. Graduate students may apply for a carrel through the circulation department in Perkins Library.

Interlibrary Loans and the Libraries of the University of North Carolina. The Duke University library provides the usual interlibrary loan services. Graduate students may borrow directly from the libraries on the four University of North Carolina campuses at Chapel Hill, Raleigh, Greensboro, and Charlotte after acquiring a Duke-UNC cooperative library privilege card from the circulation department of the Perkins Library. There is regular delivery service between the Duke University library and the libraries of the University of North Carolina at Chapel Hill and North Carolina State University at Raleigh.

Reproduction of Library Materials. The library has microfilming, photoduplication, and copy services. The rules with regard to copyright and a schedule of fees for reproduction services are available in the library at the point of service.

THE MEDICAL CENTER LIBRARY

The Medical Center Library, located in the Seeley G. Mudd Communications Center and Library Building on the Medical Campus, provides services and informational resources necessary to further education, research, and clinical activities in the medical field. In addition to the faculties and students in the Schools of Medicine, Allied Health, and Nursing, and Medical Center graduate departments, the library serves the professional and technical staffs of Duke Hospital as well as other health professionals throughout North Carolina. Over 190,000 volumes are available; approximately 2,850 journal subscriptions are received currently. Professional reference librarians are available for assistance in the use of library resources, and arrangements may be made for individual or group tours, instruction, or specialized seminars.

The History of Medicine Collections, including the Josiah C. Trent Collection, consist of rare books and manuscripts and a supporting group of histories, biographies, bibliographies, pictures, and ephemeral materials. The rare books are available to all, but are restricted to library use. Most modern books may be borrowed. The History of Medicine Collections also include the Duke Authors Collection, which preserves an archival copy of each book published by a member of the Duke medical faculty.

The Frank Engel Memorial Collection consists of a small group of books for leisure reading in nonmedical subjects, supplemented by several newspapers and popular magazines.

A reserve collection of heavily used books and journals is maintained in the Medical Sciences Branch Library located in the Nanaline Duke Building and covers the fields of biochemistry, genetics, pharmacology, and physiology.

THE SCHOOL OF LAW LIBRARY

The School of Law Library, with over 300,000 volumes (twenty-first in size among law school libraries), serves both the University and the local legal community. The collection contains nearly all reported decisions of the federal, state, and territorial courts of the United States, British Commonwealth, and representative foreign jurisdictions. It also includes the constitutions, codes, statutes, and subsidiary legislative publications of all these jurisdictions as well as many digests, indexes, bibliographies, and related research tools. A large section of the library collection is devoted to treatises on all phases of law and legal sciences, as well as to materials in the fields of history, economics, government, and other social and behavioral sciences relevant to legal research. There are files of selected federal documents, and since 1970 a complete set of congressional materials has been maintained. The Christie Jurisprudence Collection is located in the main reading room. Other collections include legal history, administrative materials, intellectual property, criminal procedure, school law, and briefs of the United States Supreme Court, the Fourth Circuit Court of Appeals, the North Carolina Supreme Court, and the North Carolina Court of Appeals. Undergraduate and graduate students whose course of study requires access to legal literature should obtain permission from the law librarian to use the collections.

RECORD LIBRARY

The Department of Music has a record library separate from the university libraries with facilities for listening to records and tapes. While all materials may be used in the listening room, recordings from the departmental collection may be borrowed only by faculty of the Department of Music. Any member of the community may borrow from the Arts Council Collection of more than 1,700 records for a nominal fee.

UNIVERSITY ARCHIVES

The Duke University Archives, the official archival agency of the University, collects, preserves, and administers the records of the University having continuing administrative or historical value. The institutional archives, which also include published material, photographs, papers of student groups and faculty, and selected memorabilia, are available for research under controlled conditions in 341 Perkins Library.

Science Laboratories

Computation Center. Extensive computer resources are essential for a contemporary university. Computing is provided at Duke by the Duke University Computation Center. The center is presently equipped with an IBM System 370 Model 158 computer with 6144K bytes of memory, four 3330-II disk drives, twelve 3350 disk drives, five tape drives, two card readers, a card punch, four printers, and a digital plotter. This computer is connected by a high-speed microwave link to the Triangle Universities Computation Center (TUCC) located in the Research Triangle Park.

TUCC is a regional computer network formed and operated jointly by Duke University, North Carolina State University at Raleigh, and the University of North Carolina at Chapel Hill. The computer equipment at TUCC consists of one IBM 3081 with sixteen million bytes of memory, one IBM 370 Model 165 with eight million bytes of memory, multiple 3330- and 3350-type disk facilities, thirteen tape drives, drums, card readers, and printers. Also available are two small Hewlett-Packard 2000 access computers which provide BASIC interactive computing.

Duke's IBM 370 Model 158 is used mostly for administrative computing and as a high-speed link to TUCC. Also connected to TUCC are four medium-speed terminals (card reader and printer) located in the Engineering Building, the Biological Sciences Building, the Sociology-Psychology Building, and West Duke Building on East Campus, as well as several low-speed keyboard terminal clusters located at various points around the University. Many personal desk-top computers located at various points on campus are also available.

All users of the Computation Center facilities are urged to obtain funds to pay for computer services. Users unable to obtain grant funding may ask for financial support from their departments when applying for services. More specific information regarding Duke computing facilities may be obtained from the Director of the Computation Center.

Botanical and Zoological Laboratories. Facilities for graduate study in the Departments of Botany and Zoology are located on the West Campus. The Biological Sciences Building contains well-equipped modern laboratories for teaching and research in the fields of botany, forestry, and zoology. Special facilities include animal rooms, greenhouses, darkrooms, refrigerated and controlled-environment laboratories, scanning and transmission electron microscopes, a Van de Graaf accelerator, X-ray machines, radiation and radioisotope equipment, and other modern research facilities. Extensive facilities for experimentation in environmental control of plant growth are available in the phytotron adjacent to the botany greenhouses.

The herbarium contains over 500,000 specimens and includes notable collections of mosses and lichens. Other assets for teaching and research are the Sarah P. Duke Gardens on the West Campus; the 11-acre experimental plot and field laboratory developed by the Department of Botany; the Duke Forest, comprising 8,300 acres of woodland adjacent to the West Campus; the field station for the study of animal behavior and ecology; and the Duke University Marine Laboratory at Beaufort, North Carolina. Duke University, through the botany and zoology departments, is a member institution of the Organization for Tropical Studies, Inc., a consortium of universities with field station facilities in Costa Rica that provide opportunities for course work and research in tropical science.

Highlands Biological Station. Duke University holds a contributing membership in the Highlands Biological Station at Highlands, North Carolina, on the southern edge of the Blue Ridge Mountains at an elevation of 4,118 feet. The situation and the region offer an excellent opportunity for field studies and some laboratory work. A limited number of qualified students in botany and zoology may make arrangements to carry out research here. Scholarships for advanced study during the summer months are available through the station.

For further information, contact Dr. J. R. Bailey or Dr. M. D. Rausher, Department of Zoology, or Dr. N. L. Christensen, Department of Botany, Duke University, Durham, North Carolina 27706.

The Phytotron. The phytotron, a national environmental control facility operated for the National Science Foundation, is adjacent to the Biological Sciences Building and is administered by the botany department. The phytotron is an integrated series of plant-growth rooms, chambers, and greenhouses, with forty-six separately controlled environments providing more than 4,000 square feet of plant-growing space. The factors of the environment controlled in the units to study plant growth include light, temperature, nutrients, carbon dioxide concentration, and humidity. By using the conditions in various day and night combinations, an exceptionally large number of environments can be simulated for testing the growth responses of plants. The phytotron also includes research laboratories and facilities for studying and monitoring the physiological processes of plants.

Research space in the phytotron is available to graduate students and faculty at Duke and to members of other educational and research organizations. For information concerning awards and research space, contact Dr. Boyd R. Strain, Director of the Phytotron, Department of Botany, Duke University, Durham, North Carolina 27706.

Duke Forest. The Duke Forest comprises approximately 8,300 acres of land in five major divisions and several smaller tracts. A ten-minute walk from campus will take one well into many parts of the Durham Division, and a network of roads and fire trails make almost all areas of the forest easily accessible.

The forest lies primarily in Durham and Orange counties, near the eastern edge of the piedmont plateau, and supports a cross-section of the woodlands found in the upper coastal plain and lower piedmont of the Southeast. A variety of timber types, plant species, soils, topography, and past land use conditions are represented. Elevations range from 260 to 760 feet. Soils of the region are derived from such diverse parent materials as metamorphic rock of the Carolina slate formation, granite, Triassic sedimentary rock, and basic intrusives.

The Duke Forest, as it is known today, had its origins in the mid-1920s when the University administration bought many small farms and interspersed forest land as buffer areas for the main campus and as an investment for the future. The forest was placed under intensive management in 1931 by Dr. Clarence Korstian, its first Director. In its early development, several basic objectives were emphasized: (1) demonstration of timber management techniques on a practical and economic basis, (2) development of an experimental forest for research in the sciences associated with timber growing, and (3) development of the area as an outdoor laboratory for students of forestry. In recent years, there has been increased interest and dependence on the forest for research in such areas as zoology, botany, and ecology by faculty and students at Duke and neighboring universities. Background information useful to researchers covers such features as soils, topography, inventory, plantation and cultural records, as well as a bibliography of past and current studies. Current work on problems associated with developmental pressures at the urban-rural interface and integrated approaches to natural resource management have multiplied the value and benefit of the forest.

The forest also serves in an educational and recreational capacity for residents of the Durham and Chapel Hill communities. Hiking, picnicking, jogging, and nature study are particularly popular pastimes.

This natural outdoor laboratory is an invaluable supplement to the instructional, research, and recreational facilities of Duke University and the region.

Forestry Sciences Laboratory. The U.S. Forestry Sciences Laboratory of the Southeastern Forest Experiment Station is located in the Research Triangle Park near Durham. This research organization provides excellent opportunities to complement research conducted by students in the School of Forestry and Environmental Studies. Specialized research projects in forest economics and in forest entomology, pathology, physiology, and soils are currently underway at the laboratory. The staff of the laboratory is available for consultation and participation in seminars. Arrangements may be made for students to conduct certain aspects of their research at the laboratory.

Marine Laboratory. The Duke University Marine Laboratory (DUML), an interdepartmental training and research facility of the University, is located on Pivers Island, adjacent to the historic seacoast town of Beaufort, North Carolina. Because of the richness and diversity of the area's flora and fauna (including direct access from the laboratory to the open ocean, Cape Lookout National Seashore Park and the Outer Banks, various tributaries and estuaries, sand beaches, maritime marshlands, and coastal forests), the laboratory provides an excellent opportunity for marine biological study and research. The laboratory accom-

modates nearly 1,500 students per year, including 15 to 20 resident graduate students who are involved in year-round activities. (For additional information concerning the graduate program, refer to the *Bulletin of Duke University: Marine Laboratory* or the section on marine sciences in the chapter "Courses of Instruction.") Academic activities at the laboratory include an undergraduate fall term and spring term, a cooperative undergraduate training program with several participating colleges and universities, and three terms of summer courses for both graduate students and undergraduates. These courses fulfill graduate credits in the Departments of Zoology, Botany, Geology, Biochemistry, and Physiology. Research activities by the year-round resident staff include the areas of biochemistry, botany, developmental biology, oceanography, physiology, and systematics-ecology. The physical plant consists of twenty-three buildings, including classroom laboratories, six research buildings, five dormitories, a maintenance complex, and a dining hall. The laboratory has skiffs, a 50-foot training vessel, the R/V *First Mate*, and a new 131-foot research and training vessel, the *Cape Hatteras*, which is operated by the Duke/UNC Oceanographic Consortium.

For information concerning teaching and research space, write to the Personnel and Auxiliaries Office, Duke University Marine Laboratory, Beaufort, North Carolina 28516.

Animal Behavior Station. The Animal Behavior Station, located less than one mile from campus, provides facilities for the study of penned, free-ranging, and caged animals in a wooded area of eighty acres. These facilities include soundproofed observation chambers, barns, aviaries, pens for large animals and birds, and two waterfowl ponds. An extensive facility for the study of prosimian primates was completed in 1968. It contains one of the world's largest collections of lemurs in rooms especially designed for observational and behavioral studies. For information regarding research space or research assistantships in animal behavior, write to Dr. P. H. Klopfer, Department of Zoology, Duke University, Durham, North Carolina 27706.

Primate Center. The Duke University Primate Center is located in the Duke Forest between Erwin and Cornwallis roads about two miles from the main campus. The colony is composed of approximately 460 prosimian primates representing five families, eleven genera, nineteen species, and twenty-six varieties. This is both the largest and the most diversified colony of living lower primates in the world. The center also houses frozen, preserved, and fossil primate collections. These collections and animals are utilized by faculty members and students in the Departments of Anatomy, Anthropology, Forestry, Geology, Psychology, and Zoology for research in primate paleontology, prosimian aging, locomotion, cytogenetics, comparative anatomy, behavior, and physiology. Applications for graduate study in one of these areas should be directed to the Director of Graduate Studies of any of the six departments. For information pertaining to the use of the Primate Center, graduate studies, or availability of research space, write to Dr. Elwyn L. Simons, Director, Duke University Primate Center, 3705 Erwin Road, Durham, North Carolina 27705.

The Vivarium. The vivarium facilities are maintained solely to support research and teaching programs of Duke University. The central vivarium contains forty-four animal housing rooms, four sterile operating rooms, two necropsy rooms, ten project rooms, and a diet kitchen. Presently, Duke medical students and physician's associate students attend classes in animal surgery at the vivarium. A farm facility also is available to accommodate dog kennels and large farm animals. The vivarium is staffed by veterinarians, technicians, and caretakers to assure humane care and treatment of animals. The vivarium is fully accredited by the American Association of Laboratory Animal Care which assures compliance with standards of NIH and D.H.E.W.

Psychology Laboratories. Situated on the main campus, the Department of Psychology occupies approximately 53,000 square feet of air-conditioned space in a building that houses general-purpose laboratories, seminar rooms, classrooms, and a variety of special facilities. These facilities include sound-attenuating and electrically shielded rooms, some for use with human subjects and others for use with animal subjects; rooms for computer-controlled experiments in human perception, memory, and language; electrophysiological recording rooms; and interconnected rooms to provide observation, communication, and videotaping capabilities for the study of social interactions and for the study of personality and clinical processes. There is a fully equipped mobile laboratory to study children at off-campus locations.

As well as such specially designed spaces, there is a variety of support facilities. To aid in the study of animal behavior, there are a breeding colony of ring doves; colonies of pigeons, rats, and cats; and an extensive collection of prosimians. To aid in physiological research, there are surgeries, histology laboratories, and photographic darkrooms. To aid in data collection and analyses, for both human and animal experiments, there are facilities for microprocessor-controlled experiments and videotaping in a variety of situations, including special setups for the study of operant conditioning, perception, and behavioral ecology.

Several laboratories have independent computers, some with graphic capabilities, and there are direct connections to the large-scale computers at the Triangle Universities Computation Center. There are also fully equipped machine, wood-working, and electronics shops staffed by full-time technicians. Additional facilities for research and teaching are available in the laboratories and clinics of the adjacent Duke Medical Center, in the Veterans Administration Medical Center nearby, and in the universities and research companies in the area.

A number of clinical installations for adults and children, specializing in clinical and guidance problems, cooperate with the department in providing facilities for research and training. Clinical research is often conducted at the Psychological Services Center operated by the clinical psychology program. This facility offers a full range of clinical services to adults, children, and families. There is an experimental school for first- and second-grade and preschool children, and an eighty-acre field station and primate facility in nearby Duke Forest for the study of animal behavior in natural settings.

Chemistry Laboratories. The Department of Chemistry is housed in the Paul M. Gross Chemical Laboratory, a building containing 146,440 square feet of total area. This well-equipped modern chemical laboratory provides conditions very conducive to research. Nuclear magnetic resonance facilities include IBM NR-80, JEOL 60 and 90 MHz multinuclear FT-NMR spectrometers, and several routine proton instruments. A Bruker 250 MHz multinuclear high field FT-NMR system shared with the Research Triangle Institute is located in nearby Research Triangle Park. Two ESR spectrometers, including a Varian E-9, provide excellent facilities for research in electron spin resonance. Mass spectrometric service is provided by a CEC 21-491 mass spectrometer and a Hewlett-Packard GC-MS system, as well as access to an A.E.I., Ltd., MS-902 located in the Research Triangle Park. X-ray diffraction cameras of all types are available, along with Enraf-Nonius automatic and Picker automatic full-circle diffractometers. Numerous instruments of varying sophistication for photoacoustic, fluorescence, infrared, U.V., and ORD-CD spectroscopy are available. Several preparative and analytical gas and liquid chromatographs are also located in the building. Computing facilities in the Department of Chemistry include a cluster of twelve IBM personal computers and a cluster of five remote job entry terminals which utilize an IBM Series 1, WIDJET system to access the dual IBM 370/165-Amdahl systems of the Triangle Universities Computation Center via a 19 Kb microwave link. The department also houses a DEC 11/42 system (1 Mbyte, 16 terminal) which operates in a multiuser

FORTTRAN environment emphasizing computer graphics as a training tool. An AED 512 color graphics/imaging terminal is also available. Numerous other computers are associated with specific research groups. The department has a machine shop and an electronics shop. The facilities of the Duke University Marine Laboratory on the coast at Beaufort, North Carolina, are available for specimen and water collecting; joint research projects with members of the resident staff have been conducted in the areas of biological chemistry and chemical aspects of oceanography. The Department of Chemistry Library, with holdings of approximately 42,000 volumes, is also located in the Paul M. Gross Chemical Laboratory. The library receives 600 current scientific serial publications and has a terminal facility for complete information retrieval.

Physics Laboratories. The Physics Building, containing about 103,000 square feet of floor space, is devoted to research and instruction in the Departments of Physics and Mathematics. An additional 27,000 square feet of space is provided in the adjacent Nuclear Physics Building. Graduate students usually have office space in one of these two buildings.

In addition to the lecture halls and the elementary laboratories, there are instructional laboratories for work in electronics and advanced physics.

Nearly half the building is devoted to special laboratories for research in microwave spectroscopy and atomic, nuclear, high-energy, low temperature, and solid-state physics. Special equipment includes microwave spectrographs operating up to 500,000 megacycles; one 4 MeV and one high-resolution 3 MeV Van de Graaf accelerator, a 30 MeV cyclotron/tandem Van de Graaf accelerator, a helium liquefier, cryostats, magnets, and associated equipment for research down to the millidegree Kelvin temperature range; a Sigma-5 computer for automatic bubble chamber film measurement and a VAX 11/780 computer for data processing in the High-Energy Physics Laboratory; and VAX 11/780 and Prime 300 computers for collecting and processing data in the nuclear structure laboratory.

The Physics-Math Library contains a large selection of books and periodicals. A spacious, well-equipped instrument shop located in the building is staffed by ten instrument makers, ten electronics technicians, and a glassblower.

Engineering Research Laboratories. The laboratories of the four departments of the School of Engineering contain extensive basic equipment that may be applied in several specialized fields. Each laboratory also contains selected sophisticated equipment used in advanced research. The facilities available for instruction and research are suggested by the following brief listing of equipment found in each department:

Biomedical Engineering. Ultrasound imaging and transducer laboratories; cellular electrophysiology and neurophysiology instrumentation; stereomicroscope, micromanipulators, stimulators, isolation units, and microelectrode puller; facilities for studying biomedical materials and surface interactions; polarizing microscope, internal reflectance infrared spectrophotometer, and dialyzers; soft tissue creep and relaxation test system; biocellular material testing equipment; quantitative videomicroscopy, laser fluorescence microscopy, and nanogram level micromechanical testing equipment; microprocessor data acquisition and control systems; cardiorespiratory measurements; respirator; and a VAX 11/780 and several PDP-11 digital computers.

Civil and Environmental Engineering. Well-equipped research laboratories are available for work in environmental engineering, soil mechanics and geotechnical engineering, solid mechanics and materials engineering, structural mechanics and structural engineering, fluid mechanics, water resources and ocean engineering, and urban systems and transportation engineering. Available research facilities include three independent closed-loop electrohydraulic dynamic loading systems (MTS) capable of applying pulses of any shape and controlled in force or

displacement modes, frequency range up to 100 cps., load capacity 6,000 and 50,000 lbs. (the 6,000 lbs. actuator can develop a constant crosshead speed up to 50,000 in./min.); equipment for fabricating specimens of and testing fiber-reinforced polymer composites; environmental chamber for testing in the temperature range of -320° to 500° F.; ultra-high-pressure triaxial shear apparatus for confining pressures up to 100,000 psi; particle tracking X-ray equipment for soil deformation studies; rock-testing facilities; model-testing equipment for anchored walls, penetrometer studies, and deep pile foundations; a large-aperture research polariscope; a reflective photoelastic polariscope; sustained-loading facility for long duration in studies of prestressed concrete; wet and dry environmental laboratories equipped to analyze a range of physical, chemical, and biological processes; a fully integrated resource recovery pilot plant; calorimetry for the measurement of heating values of secondary fuels; air classifiers interfaced with computer readout; several IBM 5150 and Apple II personal computers with graphics capability; and access to the extensive computer facilities of the Duke University Computation Center as well as the Triangle Universities Computation Center.

The research facilities in water resources are located both indoors and outdoors. Indoors, the laboratory houses flow-measurement devices (flumes, Venturi meters, manometers, etc.) and digital computation hardware. A dual capability teletype terminal is hard-wired to a Data General 32-bit MV/8000 computer supported by three-dimensional color graphic printers and, through an acoustic coupler, the same terminal can be switched to access an IBM 3081 computer at the Triangle Universities Computation Center, the WATSTORE data base system of the U.S. Geological Survey in Reston, Virginia, or any other computation system connected via telephone lines. Outdoors, the Sarah P. Duke Gardens watershed (about 100 acres on campus) has been instrumented with rain gauges, compound weirs, and liquid-level flow recorders enabling hydrologic simulation and calibration and verification with real data.

Electrical Engineering. Digital data processing laboratory equipped with the Data General 32-bit MV/8000 and DEC PDP-11/45 computers including graphic displays, X-Y tablets, remote input-output terminals, and integrated-circuit design facilities; microwave facilities for experimentation up to 35 GHz; robotics; solid-state laboratory with X-ray diffractometer and EPR spectrometer; microprocessor laboratory; solid-state power conditioning laboratory; semiconductor fabrication laboratory for integrated circuits; and access to the design, fabrication, and research facilities of the Microelectronics Center of North Carolina.

Mechanical Engineering and Materials Science. Digital data acquisition system with high-speed scanner and magnetic tape; FM-AM instrumentation recorder; four-square foot subsonic wind tunnel with six-component balance; electrostatic precipitator; submersible laser-Doppler velocimeter; hot-wire anemometer system; storage and dual-beam oscilloscopes; X-Y and strip chart recorders; temperature, pressure, strain, force, and acceleration transducers; electrodynamic shaker table; sound room; spectrum analyzers; desktop minicomputers; Tektronix graphics terminals with hardcopy; Lear Siegler ADM 3A + terminals; Data General Dasher terminal; 16-line, 9600 Baud multiplexor for Data General MV8000 computer; fuel research engine; and materials laboratories with stereo zoom microscope, research metallograph, polarizing and low-temperature microscopes, scanning and transmission electron microscopes, thermal analyzer, Instron testing machine, high vacuum system, helium leak detector, instrumented plastics extruder and injection molder, 10 kw RF generator, vacuum heat treating and arc-melting furnaces, recorders, constant load stress corrosion tester, and darkroom facilities. Additional equipment includes two GE X-ray diffraction units, including a Berg-Barrett X-ray topograph camera, Debye-Scherrer camera with Gondolphi attachment, PGT system III X-ray dispersive analyzer, and ultrahigh resolution gamma ray spectros-

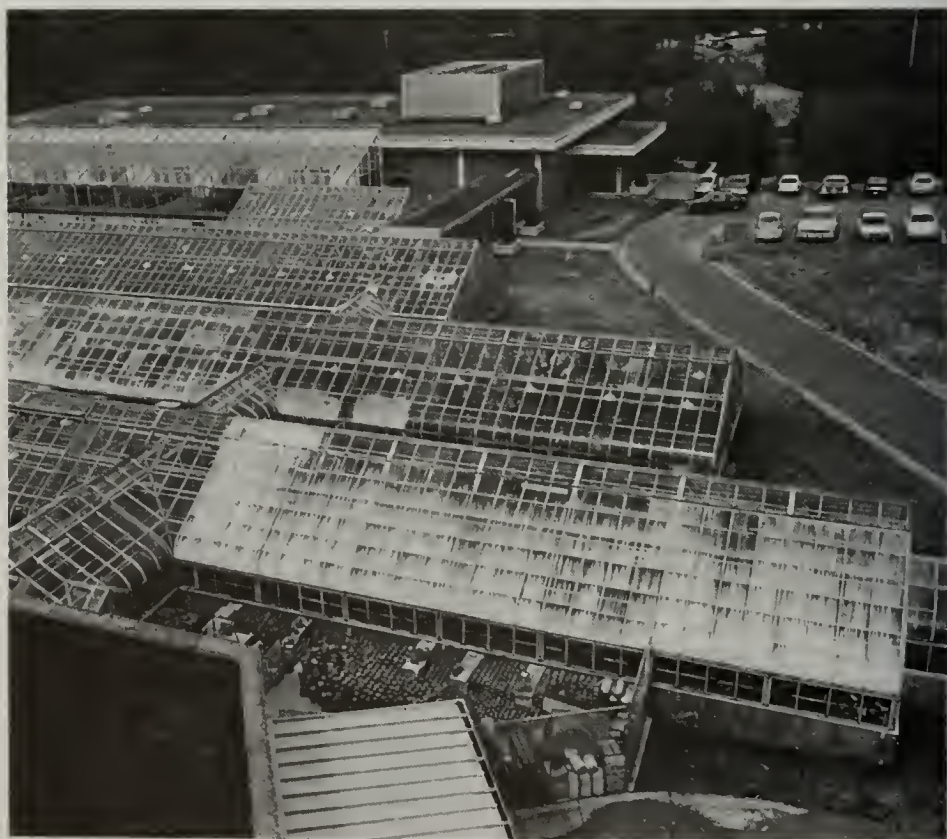
copy system for position annihilation studies. Two crystal growth systems for ionized beam deposition and magnetron sputtering are under construction.

The School of Engineering is associated with the F. G. Hall Laboratory for Environmental Research at the Duke University Medical Center, where opportunities are provided for research in environments from pressures of 1 Torr (155,000 feet of altitude) to 1600 psig (3,600 feet of depth in seawater) with a variety of gases, temperatures, and humidities. All basic equipment for measuring and recording physiological and physical phenomena are provided. Experiments may be performed in vitro or in vivo with animals or human subjects. Areas of interest have been heat and mass transfer, fluid flow, and thermal regulation.

The shop facilities of the school, as well as those located elsewhere on campus, are available to graduate students in all four departments.

The School of Engineering houses a Data 100 medium-speed card reader and printer which communicates directly with various computers located at the Triangle Universities Computation Center in the nearby Research Triangle Park.

F. G. Hall Laboratory for Environmental Research. The F. G. Hall Laboratory for Environmental Research contains eight hyperbaric and/or hypobaric pressure chambers used to simulate altitude or deep-sea diving conditions, for the purpose of both experimentation and medical treatments. The interconnected steel chambers can simulate depths of 3,600 feet, or altitude of 155,000 feet, a capability unmatched in the United States. In 1982 a research dive to 2,250 feet set a new world's record. Research of this type has led to the development of safer and faster decompression tables, better breathing mixtures, and improved types of diving equipment together with new treatments for diving accidents and diseases treated



with high-pressure oxygen. The laboratory provides opportunities for training physicians, postdoctorates, and graduate students in pressure-related medicine and physiology. The program is multidisciplinary with major participation by the Departments of Anesthesiology, Physiology, Medicine, Surgery, and Biomedical Engineering. Administration is by the anesthesiology department of the Duke University Medical Center.

The Medical Center. Over the years the Medical Center has been enlarged and its programs expanded by new construction and by the acquisition of and affiliation with established hospitals.

Currently the Medical Center occupies approximately 120 acres. The southern portion is contiguous with the main quadrangle of the University and consists of the following: Davison Building, Duke Hospital South, Baker House, Barnes Woodhall Building, Diagnostic and Treatment Building, Gerontology Building, Clinical Research I, Clinical Research II, and the Edwin A. Morris Clinical Cancer Research Building.

The northern portion includes the Nanaline H. Duke Medical Sciences Building, Alex Sands Medical Sciences Building, Edwin L. Jones Basic Cancer Research Building, Medical Research Building, Bell Building, Seeley G. Mudd Communications Center and Library, Searle Center for Continuing Education, Eye Center, and Duke Hospital North.

In the western section of the campus are: Research Park Buildings I, II, III, and IV; the Vivarium; and the Animal Laboratory Isolation Facility.

In the eastern section of the campus are Pickens Rehabilitation Center, Civitan Mental Retardation and Child Development Center, and Trent Drive Hall.

Student Life



Living Accommodations

Duke University has several residential facilities in which graduate and professional students reside: Town House Apartments and Modular Homes for single students, and Central Campus Apartments for single and married students.

Town House Apartments. Town House Apartments, located in the Central Campus area, is a thirty-two-unit complex which houses single graduate and professional school students. These apartments are more spacious than most apartments found on campus or in Durham. Because of its location away from the academic facilities of the three campuses, students find that these apartments offer a change from normal campus life and activities. They are available for continuous occupancy throughout the calendar year.

Each air-conditioned apartment includes a living room, a master bedroom, a single bedroom, a bath and a half, and an all-electric kitchen with a dining area. Spacious closets and storage spaces are provided within each apartment. A swimming pool, located in the center of the complex, is open during the late spring and throughout the summer months.

Occupants must make arrangements with the local utility companies to pay for electricity, gas, and telephone service. These companies usually require a deposit when initial applications for service are made. Utility companies should be contacted prior to arrival as it usually takes two to three days to obtain service.

Central Campus Apartments. During 1975, Duke University completed a 500-unit apartment complex. Two-and three-bedroom units are available throughout the calendar year for continuous occupancy to single and married students attending graduate and professional schools.

All utilities—water, heat, air-conditioning, and electricity—are provided. Telephones, which are provided in preinstalled locations in each apartment, are serviced through Duke University's Tel-Com telephone service. Central Campus Apartments residents are responsible for having their phones connected.

Spaces in apartments for single students are provided on an individual basis with each student paying rent per academic term to the University. This method permits students to share apartments with others of their choice. When this is impractical, the Department of Housing Management strives to place persons with similar interests together. Single-student apartments are completely furnished. An itemization of furnishings is included with the floor plans sent out in the application packet.

Central Campus Apartments are provided on a lease basis to married students and monthly rental payments should be made as required by the terms of the lease.

Married students may request either unfurnished or partially furnished apartments. Draperies and kitchen appliances are furnished in all apartments.

Modular Homes. Duke University owns six prefabricated modular homes which are located one block from the main East-West Campus bus line. Three of these three-bedroom homes are occupied by single graduate and professional students. The homes, completely furnished, provide more privacy than most apartments.

The homes are available to single graduate and professional students for continuous occupancy throughout the calendar year.

In addition to having three bedrooms, each home contains a full bath, an all-electric kitchen, a dining area, and a living room. Sliding glass doors in the living room open onto a wooden deck. An outside storage area is provided in addition to spacious closets within the home. Except for the bathroom, kitchen, and dining area, the homes are completely carpeted and paneled.

Residents of the modular homes are responsible for making arrangements with local utility companies for gas, electricity, and telephone services.

Residence Halls. Residence hall accommodations on West Campus are available for students enrolled in the summer session. Efforts are made to house all students in air-conditioned facilities, but because these are limited, use of non-air-conditioned facilities may become necessary.

For detailed information on residence hall accommodations for the summer session, contact the Housing Administration, Department of Housing Management, Duke University, Durham, North Carolina 27706.

Duke University Marine Laboratory. The Duke University Marine Laboratory, located on Pivers Island, has cottage-type residence halls which are available. Further information may be obtained from the *Bulletin of Duke University: Marine Laboratory*.

Off-Campus Housing Information. In addition to University housing, the apartment operations office maintains an off-campus listing service throughout the year. This service provides a list of privately owned homes, apartments, duplexes, and efficiencies for rent in Durham. A listing for people seeking roommates with housing or roommates needing housing is also provided. During the summer, an assistant is available to answer questions about off-campus housing.

Due to a shortage of available housing in the Durham area, the search for accommodations should begin as soon as possible after acceptance at Duke. A two- or three-day visit would provide the opportunity to use the off-campus listing service and to inspect the facilities available. Except for assuring that owners sign a statement of nondiscrimination, neither the University nor its agents negotiate between the owners and interested parties.

Application Procedure for Apartment Accommodations. The Department of Housing Management provides students accepted to the University with housing application forms and detailed information on rates, rental agreements, and availability of housing. An applicant is considered for assignment only after a completed application form accompanied by the required \$100 deposit has been received. Applications for apartments will be processed on a first-apply, first-assigned basis.

Food Services

Graduate students who eat cafeteria meals on campus may participate in the Duke University Food Services (DUFS) point plan. Six different contract options are available for graduate students and undergraduates living off campus. Depend-

ing on the plan chosen, a designated sum of points is purchased and assigned to the student on a computer account. Students then redeem the points as they choose in any of the twelve DUFs campus operations which accept points.

Contract points may be used in any of the three contract cafeterias which offer unlimited-seconds-style meals three times per day, seven days per week. One cafeteria is located on each campus: the Blue and White Room in the West Campus Union Building, the East Court in the East Campus Union Building, and Trent Drive Cafeteria in Trent Drive Hall on North Campus.

Contract points as well as cash may be used to pay for items in the following DUFs a la carte operations on West Campus:

The University Room offers multichoice, a la carte cafeteria menus at breakfast and lunch, Monday through Friday.

The Oak Room has table service and café-style menus for lunch, Sunday through Friday and for dinner, Sunday, Wednesday, Thursday, and Friday nights.

The Cambridge Inn is a delicatessen, grill, and nighttime tavern open until midnight, Sunday through Friday.

The Bryan Center Snack Bar serves continental breakfast items, grilled sandwiches, snacks, and beverages seven days per week.

The Rathskeller, also in the Bryan Center, has gourmet hamburgers, steaks, pizzas, salads, and snacks in addition to a complete wine and beer selection.

East Campus a la carte operations include the *Magnolia Room* which has a luncheon buffet each weekday and the *Down Under*, a popular tavern and snack bar.

The Trent Drive Cafeteria in Trent Hall serves an a la carte lunch menu, Monday through Friday. The *Sprout* offers soup, sandwiches, and a salad bar for lunch, Monday through Friday. *Gradeli's*, a New York-style delicatessen and grill, is also located in Trent Hall. It is open daily (except Saturday) from morning to midnight.

The Duke University Preventive Approach to Cardiovascular Disease (DUPAC) Cafeteria serves healthful, light meals for breakfast and lunch, Monday through Friday (cash only). All menus are prepared by a registered dietician with foods that are low in fats, salt, and sugars. The DUPAC Cafeteria is located in the Finch Yeager Building in Wallace Wade Stadium.

Services Available

Medical Care. The purpose of the Student Health Service is to provide any medical care and health advice necessary for a sense of well-being as the student participates in the University community. The health service maintains the Student Health Services Clinic located in the Pickens Building on West Campus and the University Infirmary on the East Campus. (The University Infirmary is not open during the summer.) Emergency transportation can be obtained by the Duke campus police. A separate fee for the Student Health Service is assessed.

The Student Health Service offers varied benefits. *The student health fee is charged all full-time students* (those registered for 15 units, assistants registered for 9 or 12 units, or students registered for at least 3 units after the preliminary examination has been passed). The student health fee is nonrefundable after the first day of classes in the semester. During the summer, all students are charged a health fee for each summer term for which they are registered; graduate students must be registered for at least 1 unit of research or 3 units of course work.

The Student Health Services Clinic offers the student outpatient services, routine laboratory and X-ray examinations in the clinic for the treatment of acute illness or injury, and advice and assistance in arranging consultation for medical treatments. Fees for such consultations or treatments must be paid by a student who is not covered by an insurance plan.

The facilities of the University Infirmary are available to all currently enrolled full-time students in residence during the fall and spring. Hospitalization in the

University Infirmary is provided for treatment of acute illness or injury as authorized by the Student Health Services Clinic physician. Students are required to pay for their meals while confined to the infirmary.

The resources of the Duke University Medical Center are available to all Duke students and their spouses and children, although any bills incurred at Duke Hospital or any other hospital are the responsibility of the student, if not covered by an insurance plan. The Student Health Program does not provide health care for spouses and dependent children of married students. Coverage of the married student's family is provided in the University's Student Accident and Sickness Insurance Plan for an additional fee.

The University has made arrangements for a Student Accident and Sickness Insurance Plan to cover all full-time students for a twelve-month period. For additional fees a student may obtain coverage for a spouse and a child. Although participation in this program is voluntary, the University requires all graduate students to be financially responsible for medical expenses above those covered by the University Student Health Program through the University Accident and Sickness Policy, a private policy, or personal financial resources. Students who have equivalent medical insurance or wish to accept the financial responsibility for any medical expense may elect not to take the Duke plan by signing a statement to this effect. *Each full-time student in residence during the fall and spring must purchase this student health insurance or indicate the alternative arrangement.* The Student Accident and Sickness Insurance Policy provides protection twenty-four hours per day during the full twelve-month term of the policy for each student insured. Students are covered on and off campus, at home, while traveling between home and school, and during interim vacation periods. The term of the policy is from the opening day of school in the fall. Coverage and services are subject to change each year as deemed necessary by the University in terms of costs and usage.

All full-time students (those registered for 15 units, assistants registered for 9 or 12 units, or students registered for at least 3 units if the preliminary examination has been passed) are enrolled in and charged for the Student Accident and Sickness Insurance Policy unless they submit properly completed and signed waivers by the published due date. All foreign students are required to enroll in the University insurance plan or complete the waiver listing the policy number and name of the insurance company providing their comparable coverage. Full payment for student insurance is due at the beginning of the term (insurance may not be paid via payroll deduction).

Counseling and Psychological Services. Counseling and Psychological Services (CAPS) is a component of student services which provides a coordinated, comprehensive range of counseling and developmental services to assist and promote the personal growth of Duke students.

The professional staff is composed of psychologists, clinical social workers, and psychiatrists experienced in working with young adults. They provide direct services to students including evaluation and brief counseling/psychotherapy regarding a wide range of concerns. These include issues of self-esteem and identity, family relationships, academic performance, dating, intimacy, and sexual concerns. While students' visits with counselors are usually by appointment, a walk-in consultation service is provided two hours each weekday for students with urgent personal concerns.

Each year CAPS offers a series of self-development seminars focusing on skills development and special interests. These explore such interests as stress management, assertiveness training, career planning, couple's communication, and study skills. Interested students may contact CAPS for further information.

As Duke's center for administration of national testing programs, CAPS also offers a wide variety of graduate/professional school admissions tests and professional licensure and certification examinations.

Another function of CAPS is the availability of the staff to the entire University community for consultation and educational activities regarding student development and mental health issues affecting not only individual students but the campus community as a whole. The staff works with campus personnel including administrators, faculty, student health staff, religious life staff, and student groups in meeting needs identified through such liaisons. Staff members are available to lead workshops and discussion groups on topics of interest to students.

CAPS maintains a policy of *strict confidentiality* concerning information about each student's contact with the CAPS staff. If students desire that such information be released to anyone, they must give written authorization for such release.

There are no charges for initial evaluation, brief counseling/psychotherapy, or self-development seminars. If appropriate, referral may be made to other staff members or to a wide variety of local resources.

Appointments may be made by calling 684-5100 or coming by the office in 214 Old Chemistry Building, West Campus between 8:00 A.M. and 5:00 P.M. Monday through Friday. If a student's concern needs immediate attention, that should be made known to the secretary and every effort will be made to arrange for the student to talk with a staff member at the earliest possible time.

Office of Placement Services. Duke University maintains an Office of Placement Services which acts as a liaison between the University and potential employers in business and industry, education, and government.

The staff is available to talk with graduate students about their future professional plans. Students who are eligible to register with the office are offered an opportunity to assemble a complete dossier of academic records and recommendations to support applications for permanent positions and to have a permanent file for future reference. Pertinent recommendations should be accumulated while the student is enrolled at Duke. Interviews with representatives visiting Duke are scheduled throughout the year for students registered with the Office of Placement Services. Part-time employment listings for the campus and Durham area are maintained in the office. All students interested in working during the summer session should register at the beginning of the term.

All services are offered without charge to Duke students and alumni.

Student Affairs

Cocurricular Activities. Graduate students at Duke University are welcome to use such University recreational facilities as swimming pools, tennis courts, the golf course, and to affiliate with the choral, dance, drama, music, and religious groups. They may become junior members of the American Association of University Professors and may affiliate with Phi Beta Kappa and social fraternities.

A full program of cultural, recreational, and religious activities is presented by the Office of Cultural Affairs, the Duke University Parish Ministry, the Duke University Union, the Office of Student Activities, and recreational clubs. The Duke University Union sponsors a wide range of programs through its committees, which are open to all segments of the campus community. Included are touring Broadway shows; rock, jazz, and pop concerts; speakers; films; a film-making program; the largest fully student-run television station in the country; art exhibits in two galleries; and a broad program in crafts located in Southgate Dormitory and the Bryan University Center. The Aquatic Center and the Card Gymnasium pool are available to students, faculty, and staff families. The handball, racketball, squash, and tennis facilities and the weight room in the basement of the Aquatic Center are also available. Interested students may participate in softball and other team sports.

The University Center complex includes the new Bryan University Center, which houses the Information Center, two drama theaters, a film theater, lounges, stores, meeting rooms, games room, rathskeller, art gallery, and other facilities; the West Union, which includes dining facilities; and Flowers Building, which includes student publications, Page Auditorium, and the University box office.

Inquiries should be directed to the Intramural Office, 105A Card Gymnasium; the Office of Cultural Affairs, 107 Page Building; Duke Chapel; the Duke University Union, Bryan University Center; or the Office of Student Activities, Bryan University Center.

Full information regarding the scheduling of major events and programs for the entire year will be found in the Duke University *Annual Calendar*; detailed and updated information for the fall and spring semesters in the *Weekly Calendar*, available each Friday; updated information for the summer session in the *Summer Session Calendar*, published at the beginning of each summer term; and the Duke *Chronicle*, published each Monday through Friday during the fall and spring and each Wednesday during the summer. Copies of the Duke University calendars may be obtained at the information desk, Flowers Building, or the calendar office, Page Building. Also during the summer, the *Summer Session Newsletter* is published weekly by the summer session office and is available at convenient locations.

Graduate and Professional Student Council. The Graduate and Professional Student Council is the representative body for the students of graduate departments and professional schools. The council provides a means of communication between schools and between graduate students and the administration. The council selects graduate students for membership on University committees. Representatives of each department and officers of the council are selected annually.

Religious Life. The Duke Chapel is open daily for prayer and meditation. The Sunday morning worship in the Chapel at 10:55 A.M. is the central focus for University religious life. The Chapel Choir is open to those who wish to sing in it. The Benjamin N. Duke Memorial Organ is played Monday through Friday from 12:30 P.M. to 1:30 P.M. Special guest recitals are also scheduled. The ministers and other members of the Chapel and Religious Life staffs are available to provide counseling help and other assistance as needs arise.

Research and Publications

The departments of Duke University are devoted to research as well as to instruction. Since a prime purpose of the University is the promotion and diffusion of knowledge, attention in the Graduate School is focused on research and publication. To this purpose, the Provost annually appoints a University Research Council which receives applications from members of the various faculties for subsidies in support of research. The policy of this council is to encourage the initiation and completion of substantial research projects.

The Duke University Press. The Duke University Press was created in 1925 as a successor to the Trinity College Press. Since its organization, the press has published more than 600 books in most of the major scholarly disciplines: literature (criticism and literary history), history, economics, political science, sociology, psychology, religion, the natural sciences, and interdisciplinary areas including gerontology, demography, medieval and Renaissance studies, and Latin-American studies. The press has instituted a number of successful series, of which the newest is Duke Press Policy Studies (DPPS), devoted to timely dissemination of current research and analyses. DPPS publishes three types of books: (1) current research and analysis on important policy problems; (2) contemporary historical analyses providing background on current issues; (3) theoretical concepts with



practical application to current policy. More than 20 books have been published in the DPPS series during its first year, with at least as many more to appear in each following year. Duke University Press has also begun publication of Duke Press Reprints, which puts worthwhile books back into print, and Duke Press Paperbacks, which makes important books, formerly available only in cloth, accessible in paperback for classroom use.

Publication has begun of another major series, *Living with the Shore*, under the general editorship of Orrin H. Pilkey, Jr., of Duke's geology department, and William J. Neal of Grand Valley State College in Michigan. This is a series of eighteen books on coastal management, which include detailed site-safety maps, guidelines for building or buying at the beach, specifics on land use and the law, shoreline dynamics, effects of hurricanes, and field-trip guides. The books will be published in both cloth and paperback and will eventually deal with the entire coastline of the United States.

Other series published by the press include Duke Monographs in Medieval and Renaissance Studies, *American Literary Scholarship* (the nineteenth volume will be published in 1983), publications of the Consortium for Comparative and Legislative Studies, Studies in Social and Economic Demography, publications of the Lilly Endowment Research Program in Christianity and Politics, and, largest of all, with forty-seven volumes published to date, the publications of the Duke University Center for Commonwealth and Comparative Studies. One of the press's more important publication projects is the ongoing contemporary publication of *The Collected Letters of Thomas and Jane Welsh Carlyle*, Duke-Edinburgh edition. Nine volumes have been published so far, and when the entire collection of letters is published, more than thirty volumes will make available, for the first time, all the known letters of both the Carlyles.

Duke University Press is one of the leading publishers of scholarly journals. The press continues publication of the *South Atlantic Quarterly*, first published at Trinity College in 1902, and in 1926 the press revived the *Hispanic American Historical Review*, published in cooperation with the Conference on Latin American Studies of the American Historical Association. In 1929 the publication of the journal *American Literature* was begun under the sponsorship of the American Literature Section of the Modern Language Association. In 1932 the press began publication of *Character and Personality*, which since 1945 has been named *Journal of Personality*. In 1935 the press began publication of the *Duke Mathematical Journal*. In 1969 *History of Political Economy* began publication as a semiannual, changing a few years later to a quarterly. Publication of *Journal of Medieval and Renaissance Studies*, a semiannual, began in 1971.

At Duke University Press the emphasis is on publication of scholarly and professional books and journals. Books are offered for course adoption whenever feasible, and submissions of materials with a course application are welcome if a suitably large course adoption market exists. Although Duke faculty members generally account for a large number of the published books and contributions to Duke University Press journals, the press has not limited its scope to any one field of study, group of authors, or region.

Early in 1983 the press moved to new quarters in the completely remodeled Crowell Science Building on Duke's East Campus. The interior of the two upper floors of Crowell (which is on North Carolina's Register of Historic Buildings) was redesigned and rebuilt to accommodate the press's new computer and the additional office space made necessary by an expanded publishing program. As part of the remodeling, Crowell's charming, late nineteenth-century exterior was restored to its original handsome appearance.

Visiting Scholars

The libraries and other facilities of Duke University are made available, to the extent practicable, to faculty members of other colleges and universities who wish to pursue their scholarly interests on the Duke campus. Such visitors are not charged unless they wish to participate in activities for which a special fee is assessed. Inquiries pertaining to visiting scholars should be addressed to the department Chairman concerned or the Dean of the Graduate School.

Postdoctoral Research

Scholars engaged in postdoctoral research often find it advantageous to use the resources of Duke University during the summer. The University welcomes these visitors and makes living accommodations (dormitory space and dining facilities) available to them during the summer sessions from May 12 to August 12. Persons desiring research privileges (library and/or laboratory) should request approval through the department in which the research interests lie or through the Graduate School.

Admission



Students Requiring Admission to the Graduate School

Admission is required of all students who intend to pursue study toward a degree offered by the Graduate School and of all nondegree students except those who (1) register as *unclassified students* in the summer session, or (2) register for graduate courses through the Office of Continuing Education. Students who have discontinued a program of study after earning a master's degree at Duke must, by letter, request permission of the Dean to undertake a doctoral program. All applicants are considered without regard to race, color, religion, sex, age, handicap, or national origin.

Unclassified Graduate Students in the Summer Session and Nondegree Students in the Office of Continuing Education. Any student who holds a bachelor's degree and who does not intend to earn an advanced degree at Duke University at the present time but who desires graduate work for professional or other reasons may consider two options. A student (1) may apply to the Director of the Summer Session for admission as an unclassified student during the summer session, or (2) may apply through the Office of Continuing Education for status as a nondegree graduate student in continuing education. Credits earned by an unclassified student or nondegree continuing education student in graduate courses taken at Duke before full admission to the Graduate School may be carried over into a graduate degree program if (1) the action is recommended by the student's Director of Graduate Studies and approved by the Dean, (2) the work is not more than two years old, (3) the amount of such credit does not exceed 12 units, and (4) the work is of G level or better.

Prerequisites

For Admission to the Graduate School. A student seeking admission to the Graduate School of Duke University must have received a bachelor's degree (or the equivalent) from an accredited institution. The student's undergraduate program should be well-rounded and of high quality, indicating ability for graduate study. Usually the student should have majored in the area of intended graduate study; many departments (see the chapter "Courses of Instruction") list specific prerequisites. Satisfactory scores on the Graduate Record Examination are required by all departments.

For Admission to the Summer Session. Students in the following categories may be admitted to the Duke University Summer Session. *Duke Students:* newly admitted and current students in good standing may attend the summer session;

no application is required. *Non-Duke Students:* other persons will be admitted to the summer session provided that (1) they are in good standing at a fully accredited college or university, or (2) they were in good standing at the last fully accredited college or university that they attended. Applications may be obtained from the Summer Session, 121 Allen Building, Duke University, Durham, North Carolina 27706. Applications may be submitted at the time of registration.

Admission to specific courses offered in the summer session is governed by the student's academic status (graduate, nondegree, or unclassified) and by the prerequisites of the course in question.

For Admission through Continuing Education. A student seeking admission as a nondegree continuing education graduate student at Duke must have received a bachelor's degree and must either reside in the area or be moving to the area with the intention of residing here for a substantial period of time. Duke University employees are eligible to take graduate courses through continuing education.

Procedures

A student seeking admission to the Graduate School should obtain an application packet from the Dean of the Graduate School. This packet contains the necessary forms and detailed instructions on how to apply. The application form must be filled out completely, signed, and returned to the Office of Graduate Admissions accompanied by a nonrefundable fee of \$35* in U.S. currency (check or money order) payable to Duke University. In addition, the student should provide the following supporting documents: (1) two copies of the official transcript from each postsecondary institution attended (college, university, or seminary) sent directly to the Graduate School by the institution; (2) two supplementary transcripts, sent as soon as possible, showing completion of work which was in progress when the earlier transcript was made; (3) three letters of recommendation from persons best qualified to judge the applicant as a prospective graduate student, written on the forms provided and returned by the applicant in the confidential envelopes that have been sealed-then-signed by the recommenders; (4) official scores on the Graduate Record Examination General (Aptitude) Test for applicants to all departments; and (5) official scores on the Graduate Record Examination Subject (Advanced) Test for applicants to programs in botany, English, music, physics, Romance languages, and zoology. It is recommended that a student take the GRE Subject Test if applying to anatomy, biochemistry, chemistry, electrical engineering, geology, history, mathematics, mechanical engineering, microbiology and immunology, pathology, pharmacology, philosophy, physiology, political science, or psychology. Applications cannot be reviewed until all supporting documents are on file. *Materials submitted in support of an application are not released for other purposes and cannot be returned to the applicant.*

Students applying for financial aid in all departments should take the Graduate Record Examination no later than the October testing in the previous year in order to meet the February 1 deadline. Information on the times and places of the Graduate Record Examinations can be provided by the applicant's college or the Educational Testing Service, Box 955, Princeton, New Jersey 08541.

Additional Procedures for Foreign Students. Fully qualified students from outside the United States are invited to apply for admission to full-time study in the Graduate School. In applying for admission the foreign student must, in addition to the information required of all students, submit with the application material (1) if the student's native language is not English, certification of English

*All fees are based on current charges and are subject to change without notice.

proficiency demonstrated by official scores from the Test of English as a Foreign Language (TOEFL), administered through the Educational Testing Service, Box 899, Princeton, New Jersey, 08541 (the Graduate School requires a score of 550 or higher on the TOEFL); and (2) a statement showing financial arrangements for the proposed term at Duke (estimated costs per calendar year are \$15,500†).

During new matriculants' first registration period at Duke, every foreign student whose native language is not English will be required to take a test to verify competence in the use of oral and written English. Until such competence is determined, admission and arrangements for an award involving teaching must remain provisional. Students found to lack necessary competence should be prepared to undertake additional English language instruction. Students who do not successfully pass the test for competence in the use of oral and written English by the end of their first year of residency will not be permitted to continue their graduate work at Duke University. Passing this examination will not meet degree requirements for a foreign language. (See language requirements for foreign students in the chapter "Registration and Regulations.")

Part-Time Graduate Study. Many graduate departments will consider applications from students wishing to pursue degree study on a full-time or part-time basis. Admission requirements, procedures, and deadlines are the same for both full-and part-time students. Part-time study requires a minimum registration of 3 units per semester, and while it is possible to obtain the master's degree on a totally part-time basis, the Ph.D. degree does require a minimum of one year of full-time residence. The time limits for completion of degrees are the same for both full-and part-time students. (See rules for time limits in the chapter "Registration and Regulations.") Financial aid through Duke University is not available to part-time students (except during their year of full-time residence). Visa restrictions do not allow foreign students to pursue graduate study on a part-time basis.

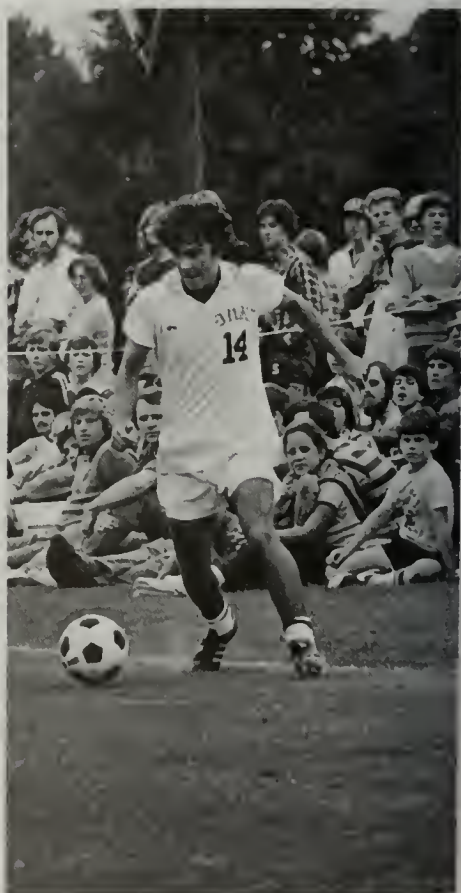
Review of Applications and Notification of Status. Admission to the Graduate School is offered only by the Dean. A departmental admissions committee, usually headed by the Director of Graduate Studies, reviews the application in depth and makes a recommendation to the Dean, who then makes the final decision on admission and contacts the student.

All applications are reviewed competitively. Attention is given to every aspect of an application, with an attempt made to evaluate past achievement as well as scholarly potential. Academic records, letters of recommendation, GRE scores, as well as the candidate's own statements are all taken into consideration in the review process.

When admission is approved, the student will receive a letter of admission from the Dean and an acceptance form. *The process of admission is not complete until the acceptance form has been returned.* An admission offer is only for the semester specified in the letter of admission, and admission may not be deferred automatically from one term to another.

Applicants who are admitted will be offered full admission, provisional admission, or nondegree admission. *Provisional admission* for a trial period of one semester or a minimum of 12 hours of course work is offered to students who appear to warrant admission but do not fully comply with admission requirements. Graduate credit earned under provisional status may be applied toward an advanced degree at Duke University if and when the student is granted full admission. *Nondegree admission* is offered to students who meet the admission requirements and who desire to engage in graduate study not subject to the restrictions of a graduate degree program. With the approval of the student's major department and the Dean of the Graduate School, a maximum of 12 units of credit

†Figures are based on 1982-83 charges and are subject to change before the fall 1983 semester.



earned under nondegree status may be applied toward an advanced degree at Duke University if and when the student is granted full admission. (See ruling under master's degrees in the chapter "Program Information.")

Summer Session Procedures. Applicants who wish to begin graduate work during the summer must apply to the Dean of the Graduate School for admission *and* to the Director of the Summer Session.

Graduate students who are in residence during the spring semester and who plan to attend the summer session should at the time of registration for the semester enroll for the desired summer session courses.

Continuing Education Nondegree Graduate Student Procedures. Applications may be obtained from the Office of Continuing Education and must be returned to the Graduate School, accompanied by a nonrefundable \$35 application fee, by August 1 for the fall semester and by December 15 for the spring semester. More detailed information is available from the Office of Continuing Education, 107 Bivins Building, Duke University, Durham, North Carolina 27708.

Deadlines for Application

It is the applicant's responsibility to make certain that the Graduate School office has received all required material before the specified deadlines. Only complete applications can be considered. (A complete application includes all required supporting credentials.) To ensure that the admissions office will have adequate time to assemble all items submitted on an applicant's behalf, applications should be sent at least *two weeks* before the stated deadlines.

FOR FALL SEMESTER

February 1. Final date for completion of applications for admission *and* award for the fall semester. This is the *priority filing date*; applications completed after this date may be considered for admission, if all spaces have not been filled, and for financial aid, if funds are still available. All students seeking fall admission should complete their applications by February 1, since it is likely that enrollment in many departments will be filled soon after this date.

July 15. Applications for admission *without award* for the fall semester, space permitting. No applications for fall received after this date will be considered.

FOR SPRING SEMESTER

November 1. Applications for admission to the spring semester, space permitting. Not all departments accept new students for the spring semester, nor is financial aid readily available for spring matriculants.

FOR SUMMER SESSION

Students seeking admission to the Graduate School for study in the summer session should apply to the Dean of the Graduate School and to the Director of the Summer Session.

April 15. Last day for completing application to summer session Term I.

May 15. Last day for completing application to summer session Term II.

Financial Information



Tuition and Fees*

The 1983-84 estimated tuition for all students (except those in health administration and physical therapy) for a full semester program in the fall and spring is \$3,390 (15 units at \$226 per unit). Part-time tuition is calculated at the same rate of \$226 per unit in the fall and spring and at the rate of \$180 per unit in the summer. Tuition charges are due and payable at the times specified by the University for that term and are subject to change without notice. A late registration fee of \$25 is charged any student not completing registration during the registration periods. The *in absentia* fee is due on the date specified by the University and is subject to a late registration fee of \$10 if not paid by that date. The fee is \$226 for 1 unit during the fall or spring and \$180 during the summer.

Payment of Accounts. Duke University does not have a deferred payment plan for tuition, fees, and other charges. New students are expected to pay tuition and fees at the time of matriculation. Following first enrollment in the Graduate School, monthly invoices are sent each student by the Bursar's office. As a part of the agreement of admission to Duke University a student is required to pay all invoices as presented. A late payment charge will be assessed for all charges not paid in full by the due date, and certain restrictions may be applied.

Graduate students who receive payments from the University for fellowships, assistantships, or employment and who plan to pay tuition and fees and/or campus housing charges via payroll deduction must make arrangements in the Bursar's office for payroll deduction by the published deadline date for each semester in order to avoid assessment of the late payment charge.

All full-time graduate students (those registered for 15 units, assistants registered for 9 or 12 units, or students registered for at least three units after the preliminary examination has been passed) are charged the student health fee and student accident and sickness insurance coverage unless they file properly completed and signed waivers in the Bursar's office by the invoice due date. *The student health fee and student accident and sickness insurance payments are due in full at the beginning of the term (they may not be paid by payroll deduction). Payment in full for campus housing is due at the beginning of each semester unless the student qualifies for University payroll deduction for the housing charge.*

Late Payment Charge. If the total amount due on the student's invoice is not received by the Bursar by the invoice due date, a penalty charge will be accrued from the billing date of the invoice (matriculation date for new students). The late

*The figures contained in this section are projections and are subject to change prior to the beginning of the fall 1983 semester.

payment charge is assessed at a rate of $1\frac{1}{2}$ percent per month (16 percent per annum) applied to the past due balance. The past due balance is defined as the previous balance less any payments and credits received during the current month (including any student loan memo credits related to the previous balance which appear on the invoice).

Restrictions. An individual will be in default if the total amount due is not paid in full by the due date. A student in default will not be allowed to register for classes, receive a transcript of academic records, have academic credits certified, be granted a leave of absence, or receive a diploma at graduation. In addition, an individual in default may be subject to withdrawal from school.

Reduction in Registration and Tuition. Refunds are granted students who reduce registration on the drop/add date at the beginning of each semester. During the four-week period at the beginning of the fall and spring semesters, students who pass the preliminary examination or final degree examination may obtain a reduction in their registration and tuition. A reduction in registration and tuition necessitated by changes in departmental service requirements for assistants may be made during the first two weeks of classes with approval of the Dean.

Refunds for Withdrawal from School during Fall and Spring Semesters. For students who withdraw from school or who are withdrawn by the University, refunds of tuition and fees are governed by the following policy.

1. In the event of death, refund of full tuition and fees will be granted.
2. In all other cases of withdrawal from the University, students or their parents may elect to have tuition refunded or carried forward as a credit for later study according to the following schedule:
 - a. Withdrawal before classes begin: full refund;
 - b. Withdrawal during the first or second week of classes: 80 percent refund (the student health fee will not be refunded);
 - c. Withdrawal during the third, fourth, or fifth week of classes: 60 percent refund (the student health fee will not be refunded);
 - d. Withdrawal during the sixth week: 20 percent refund (the student health fee will not be refunded);
 - e. Withdrawal after the sixth week: no refund.
 - f. Tuition charges paid from grants or loans will be restored to those funds on the same pro rata basis and will not be refunded or carried forward.
3. If a student changes his or her status from full time to part time, has to drop a course for which no alternate registration is available, drops special fee courses (music, golf, etc.), or drops a paid audit during the first two weeks of the drop/add period, a full refund may be granted with the approval of the Dean. (The student health fee will not be refunded.)

Refunds for Withdrawal during Summer Session. Students who will not be attending a summer term or course(s) for which they have registered (course card submitted), must follow the correct procedure and drop the course(s) prior to the beginning of class, even if they have not paid tuition and fees. Failure to drop the course(s) will result in administrative withdrawal from the summer term at the end of the first three days of the term and in billing the student for 20 percent of the tuition plus the health fee. If tuition and fees have been paid for the summer term, the following refund policies apply:

1. When applications for withdrawal from a term or drop of a course are received by the Director of the Summer Session before the first class day of a given term, full tuition and fees will be refunded.
2. When applications for withdrawal from a term or drop of a course are received by the Director of the Summer Session during the first three class

days of a given term, 80 percent of the tuition will be refunded. There is no charge for drops and adds which result in no change in tuition. The health fee will not be refunded.

3. When applications for withdrawal from a term or drop of a course are received by the Director of the Summer Session after the third class day, there will be no refund of tuition and fees.

Special Tuition Benefits for Employees. The Graduate School recognizes a special obligation to encourage the professional and personal advancement of employees.

The University pays half the tuition charges for eligible employees and eligible spouses enrolling in courses offered by the University providing the eligible individual is *not* taking courses for the purpose of attaining a degree. (1) Staff members and employees paid on the biweekly payroll are eligible for this benefit upon completion of one year of continuous service. (2) A staff member's spouse is eligible at the time the staff member becomes eligible, and a faculty spouse becomes eligible at the time that the faculty member is eligible to participate in the Retirement Annuity Plan. (3) In the case of staff members or employees paid on the biweekly payroll, permission must be obtained from the employee's immediate supervisor that he or she will be excused from work during the time that the course is to be held (if during normal working hours). (4) Although the program may be used either for courses which are to be audited or for courses which are being taken for credit, the individual may *not* be enrolled as a degree candidate.

The employee tuition benefit plan is also not applicable to on-campus contract instruction such as the American Dance Festival.

All individuals eligible for the tuition benefit plan must meet the admissions standards required of all graduate students and must be admitted to the Graduate School. No more than two courses may be taken in any semester.

Thesis or Dissertation Fees. Fees incurred in connection with a thesis or dissertation are as follows:

Binding fee, three University copies of thesis or dissertation*	\$21
Microfilming fee, doctoral degree only, upon final submission	\$35
Copyright fee (doctoral degree only, optional)	\$20

*A deposit of \$5 will be collected for each additional snap binder needed beyond the binders for the University copies.

Athletic Fee. An athletic fee of \$60 for football and basketball games, or \$15 for football games only, is optional and payable in the fall semester. The Treasurer of the University has sole responsibility for collection of fees and for arranging for the proration of fees.

Fee for Undergraduate Courses. Graduate students registering for undergraduate courses will be assessed 3 units for a nonlaboratory course and 4 units for a laboratory course.

Marine Laboratory Fee. For Marine Laboratory investigators' research table fee, see the *Bulletin of Duke University: Marine Laboratory*.

Audit Fee. Students registered full time (15 units, assistants permitted to register for 12 or 9 units, and students registered for at least 3 units if they have passed preliminary examinations) during fall and spring may audit courses without charge. Students may not audit activity courses, e.g., physical education, applied music, or special courses designed to assist graduate students in acquiring a reading knowledge of French or German. Otherwise, audit fees are \$85 per course.

During the summer, students registered for a full course program (two courses) may audit nonlaboratory courses, except physical education activity courses, applied music courses, and studio art courses, (with the permission of the instructor and the Director of the Summer Session) at no extra charge. Students carrying less than a full course program during the summer may be granted permission by the instructor and the Director to audit a course (above restrictions apply) but must pay half the University tuition charge for the course.

Vehicle Fee. Each student possessing or maintaining a motor vehicle at Duke University shall register it at the beginning of the fall semester in the security office at 2010 Campus Drive. A student who acquires a motor vehicle and maintains it at Duke University after academic registration must register it within five (5) calendar days after operation on the campus begins. Resident students are required to pay an annual fee of \$20 for each motor vehicle or \$10 for each two-wheeled motor vehicle. Resident students registering a vehicle for the first time after January 1 are required to pay \$14 for a motor vehicle or \$7 for a two-wheeled motor vehicle.

At the time of registration of a motor vehicle, the state vehicle registration certificate, a valid driver's license, and a student identification card must be presented.

If a motor vehicle or a two-wheeled motor vehicle is removed from the campus permanently and the decal is returned to the traffic office prior to January 20, there will be a refund of \$10 for a motor vehicle and \$5 for a two-wheeled motor vehicle.

Students enrolled in the summer session only must also register their motor vehicles with the traffic control office. The fee is \$3 for thirty days.

Transcript Fee. Students who wish to obtain copies of their academic records should direct requests to the Registrar's office. Ten days should be allowed for processing. A minimum fee of \$1, payable in advance, is charged for a single copy. A charge of \$1 will be made for each additional copy.

The Student Health Fee. All full-time students are assessed a fee for the Student Health Service. For the fall and spring, the fee is \$184 (\$92 each semester). For the summer, the fee is \$27 per term. Graduate students who are only in residence for summer Terms I and II are required to pay \$54 which covers both terms. The health fee will be \$21 for each five-week period at the Marine Laboratory.

Debts. Payment for tuition and fees not received by the due date will have a percentage late payment charge assessed. The penalty for late payment (*which is not a finance charge for deferring payment*) is calculated by multiplying the past due balance by 1½ percent per month (16 percent per annum) or part thereof.

No records are released until students have settled with the Bursar for all indebtedness. Failure to pay bills on or before the due dates will bar the student from class attendance until the account is settled in full. Failure to pay tuition and fees by the end of the drop/add period will result in administrative withdrawal of the student. Withdrawn students may not attend class or subsequently be registered for the term.

Expenses*

Housing Fee. The fee for Town House Apartments, not including utilities, is \$1,838 per occupant for the fall and spring on the basis of two students to a two-bedroom apartment. The fee for modular homes, not including utilities, is \$1,618 per occupant on the basis of three students to a home. Rates in Central Campus

*The figures contained in this section are based on 1982 figures and are subject to change prior to the beginning of the fall 1983 semester.

Apartments range from \$1,845 for three students in a three-bedroom apartment to \$2,850 for an efficiency apartment.

During the summer, non-air-conditioned residence hall space is available for graduate students at the following rates for each term: single occupancy—\$325; double occupancy—\$201. One-, two-, and three-bedroom apartments are also available for the summer and rates vary according to the type of unit desired and the number of persons occupying the apartment.

Housing fees are subject to change prior to the 1983-84 academic year. A \$100 deposit is required with all applications (except those for summer residence hall space). No refund on housing fees is made to students who withdraw after the date of registration, except for those who withdraw involuntarily because of a call to active duty in the armed forces. Such refund will be made in accordance with the University's established schedules. For further information on housing facilities, see the section on living accommodations in the chapter "Student Life."

Food. Food service on both the East Campus and the West Campus is described in the section on living accommodations in the chapter "Student Life." The cost of meals is estimated at a minimum of \$8 per day, or about \$1,670 for the academic year, but depends upon the needs and tastes of the individual.

Summary. The table below represents an estimate of a graduate student's basic expenses during the fall and spring for a full program of work. Miscellaneous items (recreation, travel, clothing, laundry, etc.) will vary according to personal needs and tastes.

Tuition	\$6,780
Student health fee	184
Apartment rent (Central Campus Apartments)	2,850
Meals*	1,670
Books	380
Miscellaneous (laundry, etc.)	1,650

*Meals are cafeteria-style; costs will vary according to individual tastes and needs.

The estimated cost for one term of the summer session is:

Tuition (two nonlaboratory courses or 6 graduate units)	\$1,080
Student health fee	27
Residence hall fees (non-air-conditioned double room for one term)	245
Meals†	466
Books and class materials (average)	55
Miscellaneous (laundry, etc.)	190

†This is a projected figure and subject to change prior to the beginning of the 1983 summer session.

Fellowships and Scholarships

Application Procedure. A student who desires to be considered for any of the following fellowships, scholarships, or assistantships should indicate his or her wishes by answering affirmatively the questions pertaining to financial aid on the application form for admission and award. Selection of recipients of awards is made on the basis of academic merit and departmental recommendations.

While personal financial need may not be the basis for the granting of many graduate awards, the Graduate School requires all matriculating students (except non-United States citizens) to complete the Graduate and Professional Student Financial Aid Service (GAPSFAS) form.

James B. Duke Fellowships. The James B. Duke One-Hundredth Anniversary Fund provides fellowships for students who wish to pursue a program leading

to the Ph.D. degree in the Graduate School at Duke University. Its objective is to aid in attracting and developing outstanding scholars at Duke. Selection of recipients is made by a faculty committee upon nomination by the appropriate department. These fellowships provide for payment of tuition for full registration during the academic year, plus *in residence* registration during the summer sessions. They also provide an income stipend of \$600 per month for twelve months during the duration of the award. Students entering with baccalaureate degrees may hold this fellowship for three years. Students entering with master's degrees may be fellows for two years. The award requires no service and is renewable each year upon evidence of fellowship quality performance in progressing toward the degree. The total value of a James B. Duke Fellowship over the three years of tenure for a student who passes the preliminary examination at the end of the second year is over \$40,000 at current tuition rates. There are thirty-three James B. Duke fellows currently enrolled.

Andrew W. Mellon Graduate Fellowships in the Humanities. As many as five or six one-year dissertation fellowships will be awarded to graduate students in the humanities. Selection of recipients will be made by a faculty committee upon recommendation by the appropriate department. These fellowships provide for payment of in-residence tuition and health fees plus a monthly stipend.

Endowed Fellowships. Other special endowments provide fellowships for graduate study. The Angier B. Duke Fellowship provides support on the same level as the James B. Duke Fellowship for one student for the academic year. There are five Gurney Harris Kearns Fellowships in religion ranging in value up to \$7,838. Selection for these fellowships is made through faculty committees. The E. Bayard Halsted Fellowship in science, history, or journalism is awarded to a graduate of Duke University intending to pursue an advanced degree at Duke. This fellowship, which is administered by the Graduate School, provides a monthly stipend plus tuition to an outstanding graduate student working in a broad area of science, history, or journalism. The Frank T. de Vyver Fellowship, administered by the Department of Economics, is awarded each year to an outstanding student entering the doctoral program in economics. The Clare Hamilton Memorial Endowed Fellowship, a gift of the Hamilton family in memory of their daughter, is awarded yearly on the basis of merit and need to one or more outstanding students in clinical psychology. Relatives and friends of the late Professor Charles R. Hauser established the Charles R. Hauser Fellowship to be awarded to an outstanding graduate student in the last year of work toward a Ph.D. degree in chemistry. The Department of Chemistry administers this fellowship, which is awarded to a student working in the area of organic chemistry. The Calvin Bryce Hoover Fellowship, established in honor of the late Professor Calvin Bryce Hoover, is administered by the Department of Economics and is awarded each year to an outstanding student entering the doctoral program in economics. The Robert R. Wilson Fellowship in the Department of Political Science is awarded to a student currently enrolled in or entering a doctoral program in international law, international organization, or international relations. This endowed fellowship is administered by the Department of Political Science. The Gertrude Weil Fellowship, administered by the Department of Religion, is awarded to students interested in Judaic studies.

Graduate Fellowships. Graduate fellowships funded by Duke University are available to students in the Graduate School for study during the academic year. Stipends, which include tuition, range from \$6,780 for the academic year to \$11,000 for a full calendar year. In 1982-83, 272 students held these fellowships.

Federal Fellowships.* Duke University participates in the following programs:

*United States citizenship is generally a requirement for eligibility.

National Science Foundation Fellowships. A number of students hold National Science Foundation Graduate Fellowships which provide tuition plus a stipend of \$6,900.

Other federal programs support fellowships, traineeships, and research assistantships through departmental auspices. Approximately 400 students were supported through these programs during 1982-83.

Fellowships in Medieval and Renaissance Studies. Three fellowships are awarded annually by the Duke University Committee on Medieval and Renaissance Studies. Fellows are chosen from among students enrolled in Ph.D. programs. They receive full tuition, plus a monthly stipend of \$373 for nine months, and may request two renewals of the appointment.

Special Fellowships. The following special fellowships are available to qualified Duke students from sources outside the University:

Shell Fellowships in African Studies. Fellowships are available to qualified students in social sciences who are preparing for careers in the State Department, including the foreign services of the United States, the United Nations, or other international agencies, or in research and teaching in international affairs in academic institutions within the United States. They must be citizens of the United States or residing permanently in the United States and intending to become citizens. The fellowships are intended to cover the expenses of field research in the preparation of doctoral dissertations. The stipend for each fellowship is \$4,000 plus a reasonable amount for transportation expenses. Inquiries should be made to the Administrative Assistant, Center for International Studies, 2101 Campus Drive, Durham, North Carolina 27706.

Exchange Fellowships with the Free University of Berlin. Fellowships are available through an exchange arrangement with the Free University of Berlin which will provide a fellowship for one graduate student to study during the regular academic year in Berlin. Interested students should write to the Dean of the Graduate School prior to February 1.

Special Graduate Fellowships for Minority Students. These fellowships provide for payment of tuition plus a stipend of \$3,825. They are awarded for one year to qualified applicants upon the recommendation of the departments.

International Studies Fellowships. International Studies Fellowships are intended for students from foreign countries who have completed their undergraduate education in institutions outside the United States. Students who are concentrating their programs in areas that may be broadly defined as international studies, who have the Ph.D. as their objective, and who are eligible for admission to the Graduate School may be considered.

Awardees are chosen competitively from departmental nominees, and selection is based upon the academic merit of the individual. The James B. Duke fund provides a stipend payment of \$533 per month for twelve months for a total stipend of \$6,400 for each fellowship year. In addition, the fellowship provides payment of tuition and health fees.

Departmental Fellowships. Various departments and schools within Duke University have fellowships which are available to students pursuing graduate study. Information may be obtained from the individual departments.

Graduate Scholarships. Graduate scholarships funded by Duke University are available to students in the departments of the Graduate School for study during the academic year. Awards are for full or partial payment of tuition; they range in value to \$6,780. In 1982-83, 124 students held graduate scholarships.

Assistantships

Graduate Assistantships. Appointments as graduate assistants carry a total stipend of up to \$5,400 for the academic year. The value of the stipend is determined by the time spent in assisting, the qualifications of the assistant, and the nature of the work assigned. Graduate assistants also may receive scholarships or fellowships in addition to payments for service as an assistant. In 1982-83, 179 students held graduate assistantships.

Research Assistantships. Appointments are for predoctoral candidates whose special training and qualifications enable them to serve as assistants to individual staff members in certain departments. Stipends may be up to \$7,200, depending on the nature of the assistance and the assisting time required. In 1982-83, approximately 198 students held research assistantships.

Part-time Instruction. Several departments offering graduate work have exceptionally qualified graduate students work as part-time instructors, tutors, and teaching assistants. These students may qualify to reduce their registration to 9 or 12 units per semester.

Payment of Awards

The payment of income stipends to graduate assistants starts on September 25 and is made in equal payments on the twenty-fifth day of each month thereafter. Fellowship or scholarship stipends for which no service is required beyond that required of all students in a program start on September 30 and are made in equal payments on the last working day of each month.

Stipends awarded under fellowships and scholarships are not subject to income or social security tax; however, awards to graduate assistants having teaching or research assignments may be subject to both. The Graduate School office will supply detailed information.

It is the responsibility of the student to be sure that tuition and fees are paid or that arrangements have been made with the appropriate office or department for submission of tuition payment notices to the Bursar (101 Allen Building). Graduate students should contact either the Director of Graduate Studies in their department or the Graduate School Financial Aid Coordinator (123 Allen Building) depending upon the type of award. Faculty, senior administrative staff, employees, and eligible spouses, not in degree programs, should contact Harrison Brooke (303 Allen Building) regarding tuition benefits.

Loans

Students who anticipate a need to supplement their financial resources through loans or college work-study employment should obtain and complete a Graduate and Professional Student Financial Aid Service (GAPSFAS) form. These forms are available at most financial aid offices or from the Financial Aid Coordinator, Graduate School, Duke University, Durham, North Carolina 27706. A student seeking a loan should contact his or her state lending agency. A list of state lending agencies with addresses is available upon request from the Graduate School.

It is the policy of the Graduate School to provide loans through the University to help students meet their educational expenses. Only students with full-time status who meet the federal criteria for need but who are unable to obtain a loan from their state agencies are eligible for loans. Loan funds are provided through the Federally Insured Student Loan Program and the National Direct Student Loan Program. Generally, loans made from these funds, or in the case of loans from state

agencies, bear no interest charge to qualified borrowers while they maintain student status and for a short period thereafter. Interest during the repayment period is at a generally favorable rate. The maximum amount of a loan through Duke for first-year graduate students is usually limited to the amount of tuition. Proof of eligibility for state loans may be less demanding and more favorable to the borrower.

Inquiries concerning loans should indicate the department of intended matriculation and include all pertinent information concerning application to a state agency. These inquiries should be addressed to the Financial Aid Coordinator, Graduate School, Duke University, Durham, North Carolina 27706.

Work-Study Program Employment

Funds are available through the college work-study program for short-term or part-time employment of graduate students. A student who wishes to apply for work-study must complete a GAPS FAS form. Students considering the possibility of work-study for the fall should submit GAPS FAS forms by April 15, if possible. Eligibility requirements are similar to those of the federal loan programs. In addition to departmental employment opportunities, the placement office maintains a listing of employment openings for students.

Summer Financial Aid

A limited amount of financial aid is available to students in summer study. Summer financial aid, determined according to demonstrated need, may consist of institutional grant funds and/or low interest loans from the Federally Insured Student Loan program and the National Direct Student Loan program. To qualify for summer school aid, a student must be enrolled or accepted for enrollment at Duke during the academic year immediately preceding the summer for which aid is requested. (Students enrolled only for the summer may be eligible to borrow from outside lenders under the Federally Insured/Guaranteed Loan program in their home states or from the schools at which they are regularly enrolled. They should contact their college's financial aid office or the state department of higher education for information and applications.) Terms and amounts of loans are determined by the lending agencies. The college work-study aid is determined by the financial aid office based upon the student's financial need and the availability of funds. Graduate awards are determined by departments depending on usual criteria and availability of funds.

Registration and Regulations



Registration

Who Must Register. All students who are enrolled in the Graduate School in any program and who have not been granted a leave of absence by the Dean must register each fall and spring until all degree requirements are completed.

Registration Periods. After receiving notification of admission to the Graduate School and returning a statement of acceptance of admission, the student must register for the term indicated in the admission letter.

Fall and Spring. A newly admitted graduate student first confers with the Director of Graduate Studies of the major department, who signs a course card listing the course work to be taken. The student then presents this course card to registration officials for enrollment in the selected courses and pays tuition and fees, or verifies that tuition and fees have been paid if he or she has an award, in the Bursar's office (101 Allen Building).

Duke University does not defer payment for tuition and fees. Payments not received by the due date will have a late payment charge assessed. The penalty for late payment (*which is not a finance charge for deferring payment*) is calculated by multiplying the past due balance by $1\frac{1}{2}$ percent per month (16 percent per annum) or part thereof. Failure to pay tuition and fees by the end of the drop/add period will result in administrative withdrawal of the student. Withdrawn students may not attend class or subsequently be registered for the term. After the first registration, a student must register for subsequent semesters at the regular stated time for registration. Currently enrolled students who fail to register at the first scheduled registration period for the subsequent semester incur a penalty for late registration. A former student who has been on leave of absence and who intends to register to resume a degree program must give the department and the Dean notice of this intention two months before registration.

Summer. Students who are in residence at Duke University during the spring and who plan to enroll for courses or research in the summer session may have their course programs approved by the Director of Graduate Studies during the week of Graduate School registration in March. Course cards should be submitted in the Office of the Summer Session. Summer session students may register in the summer session office at any time beginning with the March registration period and up to the Friday preceding the start of the appropriate term. Graduate students who are in residence during the spring and who intend to remain in residence during one or more of the summer session terms without registering for course work must register for 1 unit of research with the Graduate School.

Duke graduate students who are registered *in absentia* for the spring may register for the summer session by mail, provided they are in good academic

standing or have received permission from the appropriate Director of Graduate Studies.

Students who are not in residence at Duke during the spring (newly admitted students to the Graduate School and students of other colleges and universities desiring to earn credits for transfer) may register by mail for the summer session. Advance registration by mail includes:

1. Completion of the summer session application. (Applications may be obtained by writing to the Office of the Summer Session, 121 Allen Building.)
2. Admission to the summer session by the Director of the Summer Session. (Students who have been admitted to the Graduate School for the summer term need not apply to the summer session.)
3. Submission of a properly approved and completed course card in the Office of the Summer Session.

The University does not mail statements for summer session tuition and fees. All tuition and fees should be paid in the Office of the Bursar (101 Allen Building) at least *three full working days* prior to the first day of class (see summer session calendar). Students who fail to pay tuition and fees before this deadline will be assessed a late payment charge. Students registering by mail may forward payment to the Office of the Bursar, 101 Allen Building, Duke University, Durham, North Carolina 27706. Failure to pay tuition and fees by the end of the drop/add period will result in administrative withdrawal of the student. Withdrawn students may not attend class or subsequently be registered for the term.

Late Registration. All students are expected to register at the times specified by the University. A late registration fee of \$25 is charged any student registering late, including a current student who delays registering until the special registration for new students.

Change of Registration. During the first *two weeks* of the fall or spring semester, registration may be changed with the approval of the Director of Graduate Studies, if no reduction of fee is entailed. If fees are to be refunded, the approval of the Dean of the Graduate School is required. For the succeeding two weeks, courses may be dropped and equivalent hours of research or residence credit added with the approval of the Director of Graduate Studies, the instructor of the course, and the Dean. Students who pass the preliminary examination during the first four weeks of the fall or spring semester may alter their registration, with fee adjustments, at any time during that period.

During the summer session, all late registrations and course changes must be completed by the end of the third class day of each term, and must be approved by the Director of Graduate Studies, or, in the case of the special or unclassified student, by the Director of the Summer Session. Students who are out-of-town must contact their Directors of Graduate Studies to arrange for withdrawal or for dropping or adding courses; non-Duke unclassified students should contact the Director of the Summer Session. After the first three days of classes, no course may be added. A course may be dropped, however, until the end of the second week of each term with the permission of the Director of Graduate Studies and with a *WP* or *WF* grade assigned by the instructor. (The permission of the Director of the Summer Session is required for students from other universities or colleges.) Courses dropped after the second week are ordinarily assigned an *F* grade, as are courses dropped without permission.

Since summer session courses present a program of study in more concentrated and rapid form than in the fall or spring, students are advised to register on time and to be present at all class sessions.

Additional Degree Regulations—The Master's Degrees

Transfer of Graduate Credits. A maximum of 6 units of graduate credit may be transferred for graduate courses completed at other institutions. Such units will be transferred only if the student has received a grade of *B* (or its equivalent) or better. *In any case, the transfer of graduate credit does not reduce the required minimum registration for a master's degree at Duke.* Students who wish to transfer up to 6 units into their programs must register at Duke for units equivalent to the number they are transferring. Requests for transfer should be submitted on the approved Graduate School form (T1).

A student who is granted such transfer credit may be permitted to register for as much as 12 units of thesis research instead of the usual 6 units. As another option, a student may take as many as 6 units of further undergraduate training or 6 units of required language courses on the undergraduate level. In no case will credit be allowed for extension or correspondence courses.

Nondegree Students. A student may apply to the Graduate School as a nondegree student or may register for a graduate course through the Office of Continuing Education as a nondegree student. In order to change to a degree program in the Graduate School, the nondegree student will need to make a formal application for admission to a degree program in the Graduate School.

Credit for graduate courses taken at Duke by a student (not undergraduate) before admission to the Graduate School or while registered as a nondegree student through the Office of Continuing Education or the Graduate School may be carried over into a graduate degree program if: (1) the action is recommended by the student's Director of Graduate Studies and approved by the Dean, (2) the amount of such credit does not exceed 12 units, (3) the work is of G level or better, and (4) the work is not more than two years old.

Time Limits for Completion of Master's Degrees. Master's degree candidates who are in residence for consecutive academic years should complete all requirements for the degree *within two calendar years* from the date of their first registration in the Graduate School. Candidates must complete all requirements *within six calendar years of their first registration.*

To be awarded a degree in May, the recording of transfer credit must be completed by the first day of the final examination period and all other requirements must be completed by the last day of the final examination period. If a thesis is one of the requirements, it must be submitted to the Graduate School office no later than April 15. Candidates desiring to have their degrees conferred on September 1 must have completed all requirements, including the recording of transfer of credit, by the final day of the Duke University summer session. Candidates completing degree requirements after that date and during the fall will have their degrees conferred on December 30.

The Thesis. The thesis should demonstrate the student's ability to collect, arrange, interpret, and report pertinent material on a research problem. Although a publishable document is not required, the thesis must be written in an acceptable style and should exhibit the student's competence in scholarly procedures. Requirements of form are set forth in the *Duke University Guide for the Preparation of Theses and Dissertations*, copies of which are available in the Graduate School office.

MASTER OF ARTS

Completing the Program with Thesis. All basic requirements for preparing the thesis are described in the *Guide for the Preparation of Theses and Dissertations*, available in the Graduate School office.

Four typewritten copies of the thesis bound in snap binders, which may be secured through the Graduate School office, must be submitted in an approved

form to the Dean of the Graduate School on or before April 15 for a May degree, one week before the final day of the Duke University second summer term for a September degree, one week before the final day of the fall semester for a December degree, and at least one week before the scheduled date of the final examination. The copies then will be distributed by the student to the several members of the examining committee. Two copies for the library and one copy for the adviser will be bound upon payment of the University binding fee of \$21.

Completing the Program without Thesis. Individual departments decide the options with which a Master of Arts degree may be completed without presentation of a thesis. The student's committee usually outlines the requirements for a degree program after the student has completed at least 9 units of graded course work. Beyond the 24 units required in major or related course work, 6 units may be earned either through course work or through other academic activities approved by the student's department and committee. Such academic exercises might include an additional 3 units of graded course work complemented, for example, by the following: (1) passing an oral examination on a three-to five-page research prospectus, plus a substantial bibliography on a topic within the student's major field, or (2) submission to the committee of two carefully revised term papers, preferably written originally for different instructors and earning a grade of G or higher. In any case, the student's total minimum registration will be for 30 units of graduate credit at Duke University followed by a final examination.

The Examining Committee and the Examination. The faculty member who directs the student's program recommends an examining committee composed of himself or herself and two other members of the graduate faculty, one of whom usually must be from a department other than the major department. If the student has been permitted to take related work within the major department, the third member may be chosen from within the department. Nominations for membership on this committee are submitted for approval to the Dean of the Graduate School at least one week preceding the final examination.

The committee will conduct the examination and certify the student's success or failure by signing the card provided by the Graduate School office. This card indicates completion of all requirements for the degree. If a thesis is presented, the committee members also sign all copies of the thesis, and the candidate then returns the original and first two copies to the Graduate School office.

Filing the Intention to Graduate. On or before *February 1* for a May degree, on or before *August 1* for a September degree, or on or before *December 1* for a December degree, and at least one month prior to the final examination, the student must file in the Office of the Graduate School, on the official form, a declaration of intention to graduate. The declaration of intention presents the title of the thesis or specifies alternative academic exercises on which the degree candidate will be examined. The declaration must have the approval of both the Director of Graduate Studies in the major department and the Chairman of the student's advisory committee.

MASTER OF SCIENCE

Language Requirement. There is no foreign language requirement in Master of Science degree programs.

Other Degree Requirements. Specific requirements vary according to the department. Please consult the chapter "Courses of Instruction" for departmental information concerning prerequisites, minimum units required, and major and related work.

Thesis and Examination. Some departments require a thesis; all departments require an examination. The regulations and options for theses and other means of

completing the program, as well as the provisions for examination and the examining committee, are the same as the requirements for the Master of Arts degree.

MASTER OF HEALTH ADMINISTRATION

Consult with the Director of Graduate Studies in the Department of Health Administration.

Additional Degree Requirements—The Doctoral Degree

Transfer of Credit. From a completed master's degree, up to 30 units of graduate credit in which a grade of G (or its equivalent) or better was earned may be accepted by transfer only after the student has earned at least 12 units of graduate credit at Duke. Such transfer credit must be on the recommendation of the Chairman of the student's advisory committee and the Director of Graduate Studies of the student's major department and must not be more than six years old at the time the preliminary examination is passed. (Graduate School form T1 should be used to request transfer of credit.)

Credit for graduate courses taken at Duke by a student (not undergraduate) before admission to the Graduate School or while registered as a nondegree student may be carried over into a graduate degree program if: (1) the action is recommended by the student's Director of Graduate Studies and approved by the Dean, (2) the work is not more than two years old, (3) the amount of such credit does not exceed 12 units, and (4) the work is of G level or better.

DOCTOR OF PHILOSOPHY

Requirements. The formal requirements for the Ph.D. degree are as follows: (1) major and related courses, (2) foreign language(s) in many departments, (3) a supervisory committee for the student's program of study, (4) residence, (5) preliminary examination, (6) dissertation, and (7) final examination. In order to be considered for candidacy for the Ph.D. degree, the student must have passing grades in all course work and a grade of G or better on at least 9 units of this course work.

Major and Related Work. The student's program of study demands substantial concentration on courses in the major department. However, a minimum of 6 units in a related field approved by the major department must be included. A few programs have been authorized by the Executive Committee of the Graduate Faculty to utilize courses in fields within the major department in fulfilling the related field requirement.

Foreign Languages. The regulations of the Graduate School require a reading knowledge of one foreign language for the Ph.D. Some departments require two languages; other departments have received approval from the Dean and the Executive Committee of the Graduate Faculty to waive the foreign language requirement. For specific departmental requirements, see individual departmental sections in this bulletin or contact the appropriate Director of Graduate Studies.

Students working toward the doctoral degree should complete any language requirements set by their departments by the end of their first year of residence. Those who fail to meet the requirement by the end of their third semester of residence should register in the appropriate special reading course. Any foreign language requirement must be met before the preliminary examination is taken.

Committee to Supervise the Program of Study. As early in a student's course of study as is practicable and *not later than two months before the preliminary examination*, the Director of Graduate Studies in the major department will

nominate for the approval of the Dean a supervising committee consisting of five members, with one member designated as Chairman. This committee will include at least three graduate faculty members of the major department and, usually, at least one from outside of the department. For programs in which approval has been granted for related work from a clearly differentiated division within the department, one member of the committee will be chosen from that division. In this circumstance all members of the supervisory committee will be from the same department. This committee, with all members participating, will determine a program of study and administer the preliminary examination. The preliminary examination must be administered by all five members of the student's committee.

Residence. The *minimum* full-time residence requirement is one academic year (two consecutive semesters in the same academic year) at Duke. The *minimum* registration requirement is 60 units of graduate credit, of which not more than 30 units of a completed master's degree may be accepted by transfer. The transfer of credit will not reduce the minimum requirement of one full-time academic year at Duke. (For the definition of residence, see the section on general academic regulations in this chapter.) Students who have completed the requirement will be permitted to reduce their registration to 3 units per semester after they have passed the preliminary examination. If there are undergraduate deficiencies in their programs, they may be required to take undergraduate courses for which they will not receive degree credit. Even if there are no such undergraduate deficiencies, the student's supervisory committee will determine what requirements above the minimum, if any, the student must meet.

Credit for Summer Work. Credit earned in the summer session will not reduce the minimum required residence. (See above.)

Time Limitations. Courses, language certifications, or other credits for advanced standing which are more than six calendar years old at the time that the preliminary examination is passed will not be accepted toward fulfilling the minimum requirements of the doctoral degree.

Ordinarily a student should pass the preliminary examination by the end of the third year of graduate study. A student who has not passed the examination by the end of the third year of full-time registration must file with the Dean of the Graduate School a statement, approved by the Director of Graduate Studies in the major department, explaining the delay and setting a date for the examination. Except under unusual circumstances, extension will not be granted beyond the middle of the fourth year.

The doctoral dissertation should be submitted and accepted within two calendar years after the preliminary examination is passed. Should the dissertation not be submitted and accepted within four years after the examination, the candidate, with the approval of the committee, may petition the Dean of the Graduate School for an extension of up to one year. If this extension is granted and the dissertation is not submitted and accepted by the new deadline, the student will be dropped from candidacy. The student must then pass a second preliminary examination to be reinstated as a candidate for the degree. In such cases, the time limit for submitting the dissertation will be determined by the Dean of the Graduate School and the candidate's committee.

In cases of particular merit, the Dean of the Graduate School may extend the limits of the total elapsed time within which credit will be allowed for courses, the language examination, and the preliminary examination. The graduate faculty of the departments will have these limits in mind when a student is considered for admission or readmission to the Ph.D. program, for approval to take the preliminary examination, and for approval to submit the dissertation and take the final examination. In instances of excessive elapsed time, revalidation of credit may be required. Responsibility for requiring such revalidation rests with the department.

Proposed requirements for revalidation require the approval of the Dean of the Graduate School.

Preliminary Examination. A student is not accepted as a candidate for the Ph.D. degree until the preliminary examination has been passed at Duke. The examination ordinarily covers both the major field and related work. In the summer a preliminary examination may be scheduled only between the opening and closing dates of the summer session.

Privilege of Re-examination. A student who fails the preliminary examination may apply, with the consent of the supervisory committee and the Dean of the Graduate School, for the privilege of a second examination to be taken no earlier than three months after the date of the first. Successful completion of the second examination requires the affirmative vote of all committee members. Failure on the second examination will render a student ineligible to continue a program for the Ph.D. degree at Duke University.

Reduction in Registration. A student who passes the preliminary examination during the first four weeks of the fall and spring is eligible for a reduction in required registration and should arrange with the Graduate School office the desired changes in registration.

The Dissertation. The dissertation is expected to be a mature and competent piece of writing, embodying the results of significant and original research.

One month before the dissertation is presented and no later than *February 1* preceding the May commencement, *August 1* for a September degree, and *December 1* for a December degree, the student must file with the Dean of the Graduate School, on the official form available in the Graduate School office, the title of the dissertation. This title must receive the written approval of both the Director of Graduate Studies of the student's major department and the professor who directs the dissertation.

The basic requirements for preparing the dissertation (type of paper, form, and binding) are prescribed in the *Guide for the Preparation of Theses and Dissertations*, copies of which are available in the Graduate School office.

The dissertation must be completed to the satisfaction of the professor who directs the dissertation, members of the student's advisory committee, and the Dean of the Graduate School. Four typewritten copies, bound in snap binders which may be secured through the Graduate School office, must be submitted to the Dean of the Graduate School on or before *April 1* preceding the May commencement, one week before the end of the Duke summer session for a September degree, or one week before the end of the fall semester for a December degree. The dissertation must be submitted to the Graduate School office at least seven days before the scheduled date of the student's examination.

All doctoral dissertations are published on microfilm through Xerox University Microfilms, Ann Arbor, Michigan. Authors may copyright them if they wish. Abstracts are published in *Dissertation Abstracts International*.

In brief, all copies of the dissertation, the original in clean type, will remain in snap binders until after the final examination. Two extra copies of the abstract (not more than 350 words long) are submitted when the dissertation is first presented to the Graduate School office. A nonrefundable fee of \$35 is charged for microfilming. If copyright is desired, an additional fee of \$20 is charged. The original and two copies will be bound at a cost of \$21. A deposit of \$5 is collected for each snap binder on loan from the library used for dissertation copies that will not be bound.

Final Examination. The final examination is normally administered by the five members of the supervising committee, but it may be administered by four members of the committee if the member representing the related field is present. In either case, successful completion of the final examination requires at least four affirmative votes. The final oral examination shall be primarily on the dissertation;

however, questions may be asked in the candidate's major field. Except in unusual circumstances approved by the Dean, a final examination will not be scheduled when the University is not in session.

A student who fails the final examination may be allowed to take it a second time, but no earlier than six months from the date of the first examination. Permission to take the second examination must be obtained from the professor who directed the dissertation and from the Dean of the Graduate School. Failure to pass the second examination renders the student ineligible to continue work for the Ph.D. degree at Duke University.

Deposit of the Dissertation. After passing the examination, candidates bring to the Graduate School office the original and the first two copies of the dissertation, properly signed. At this time they sign the microfilming agreement and pay microfilming and copyright fees.

General Academic Regulations

Residence. Although graduate study consists principally of individual reading, research, and laboratory experimentation under guidance, academic progress in the United States is generally measured and recorded in terms of course hours and credits. Credit for courses, seminars, research, and residence, and corresponding tuition and fees are stated in terms of units. One unit is equivalent to one semester hour. The term *residence* designates full-time study and research in close proximity to the facilities provided, as opposed to part-time study incidental to a full-time occupation. For purposes of satisfying the residence requirement of the Ph.D. degree, residence of one year is defined as two successive academic semesters of no fewer than 9 units each semester. Each student who receives financial assistance from the University must register for a full program (9 units or more) until the preliminary examination is passed. Part-time students receive no financial assistance from the University. The minimum registration for students in an approved part-time program is 3 units per semester until the preliminary examination is passed. However, part-time students must fulfill the minimum full-time residence requirement of one academic year (registration of 9 units or more during two consecutive semesters) in order to complete degree requirements. No residence credit can be accepted toward the requirement for the Ph.D. degree for work completed during the summer session; however, registration during the summer will apply toward the requirement of 60 units. All work required for the master's degree must be completed within six years of the date of matriculation. The six-year time limitation also applies to master's candidates engaged solely in summer study. A student who completes all degree requirements during the summer session will be granted the degree in September.

Course Load. Graduate students are considered fully registered when they enroll for the number of credits their programs require. Required registration is set in consideration of a student's obligation to teach or assist and of a student's progress toward fulfilling degree requirements. In the academic year normal registration for the *resident doctoral* student who does not hold an appointment as part-time instructor or assistant and does not engage in part-time work, is 15 units a semester or 30 units an academic year. The registration for *resident doctoral* students who hold such appointments or undertake such work is either 12 units or a minimum of 9 units, depending upon the number of hours a week they are required to devote to such duties. Resident doctoral students who receive financial assistance from the University carry full registration through the semester in which they pass the preliminary examination. Part-time Ph.D. students who have completed the minimum residence requirement of one full-time academic year must continue to register for a minimum of 6 units per semester until they pass the

preliminary examination. All Ph.D. students who have completed the residence requirement and passed the preliminary examination and remain at Duke continue to register for a minimum of 3 units each semester until the dissertation is accepted. Those who choose to go away from the University must register for 1 unit each semester *in absentia* in order to keep their programs active.

The registration requirements for a student pursuing a master's degree are a minimum of 6 units each semester until completion of 24 units of graded work. A student who has completed all requirements except a thesis and has not matriculated in a doctoral program at Duke may register for as few as 3 units per semester. If the student decides to go away from the University, he or she may register for 1 unit *in absentia* until a minimum of 30 units is completed. A student in a master's program requiring no thesis may choose to take courses in addition to the required 24 units of graded work or register according to the pattern of 3 units at Duke or 1 unit *in absentia* as necessary for departmental requirements in lieu of a thesis to complete the minimum requirements of 30 units.

The registration of 1 unit a semester *in absentia* provides occasional consultation with the thesis or dissertation supervisor.

It is necessary to be a fully registered student according to the regulations listed above in order to establish eligibility for library carrel and laboratory space, student housing, University and some outside loans, and the Student Health Service, including accident and sickness insurance. See the chapter "Student Life."

Part-time Graduate Study. The regulations of the Graduate School permit part-time study provided the student meets the minimum registration requirements for the degree program. The Ph.D. program does require a minimum of one year of full-time residence.

Summer Session. In each term of the summer session, students may register for a maximum of two courses. A student who wishes to register for more than two courses must obtain the approval of the appropriate Director of Graduate Studies. Unclassified students must obtain approval from the Director of the Summer Session. Students who are in residence during the academic year and wish to continue study and to use University facilities, including the Student Health Service, during the summer, must register for 1 unit in the first summer session term. This registration provides use of facilities for both terms of the summer session.

Credits. The following regulations pertain to credits earned outside the Duke University Graduate School:

Graduate Credit Earned before the A.B. Degree Is Granted. Ordinarily no credit will be allowed for graduate courses taken before a student has been awarded the A.B. or B.S. degree. However, an undergraduate student at Duke University, who at the beginning of the final semester lacks no more than three courses in order to fulfill the requirements of the bachelor's degree, may apply for admission to the Graduate School for that final semester. If the student meets the requirements for admission, permission may be obtained from the Dean of the Graduate School to enroll for graduate courses to bring the total program to no more than five courses. In addition to undergraduate registration, the student must register in the Graduate School at the beginning of the semester in which graduate credit is to be earned in order for the courses to be credited toward a graduate degree program.

Transfer of Graduate Credits. Transfer of credit for graduate course work completed at another institution will be considered only after a student has earned a minimum of 12 units of graduate study at Duke University. After completing the 12 units, the student should file a request for transfer of credits on the appropriate Graduate School form.

Graduate Credit for Courses Taken in the School of Law. Upon recommendation of the Director of Graduate Studies, and approval of the Dean of the Graduate School, a

student in the social sciences may take certain courses in the School of Law for graduate credit. In some instances, courses in the School of Law may be considered as fulfilling requirements for related work. To register for such courses, a student should present a letter from the Director of Graduate Studies in the major department to the Dean of the School of Law requesting permission to register for specific courses.

Summer Session Credit. Summer session *credit* does not mean degree credit at Duke University unless the student has been admitted as a degree candidate by one of the colleges or schools of the University. The majority of summer session courses carry 3 units of credit and require one term of residence. A student taking a course for credit is expected to do all the work required and to take the final examination, and will receive a grade. (G.I. Bill benefits are available only to those veterans who enroll for credit.)

For regulations concerning the application of graduate credit to a degree program at Duke, earned by a student (not undergraduate) while attending the Duke summer session, see the section on transfer of graduate credit in this chapter.

Reciprocal or Interinstitutional Agreements with Neighboring Universities. Under a plan of cooperation between Duke University and the University of North Carolina at Chapel Hill, North Carolina Central University in Durham, and North Carolina State University at Raleigh, students properly enrolled in the Graduate School of Duke University during the regular academic year, and paying full fees to this institution, may be admitted to a maximum of two courses per semester at one of the other institutions in the cooperative plan. A doctoral student who has passed the preliminary examination and registers for a minimum of 3 units at Duke may register for 3 to 6 additional units at the other institution. Under the same arrangement, students in the graduate schools in the neighboring institutions may be admitted to course work at Duke University. Credit so earned is not defined as transfer credit. To take advantage of this arrangement during any summer session term, the student registers each term for 3 units of credit at the home institution and 3 units of credit at the other institution, for a total of 6 units. All interinstitutional registrations involving extra-fee courses or special fees required of all students will be made at the expense of the student and will not be considered a part of the Duke University tuition coverage. This reciprocal agreement does not apply to contract programs such as the American Dance Festival.

Identification Cards. Graduate students are issued two-part identification cards which they should carry at all times. The cards are the means of identification for library privileges, athletic events, and other University functions or services open to them as University students. Students will be expected to present their cards on request to any University official or employee. The cards are not transferable, and fraudulent use may result in loss of student privileges or suspension. A student should report the loss of a card immediately to the Registrar's office. The cost of a new ID card is \$5.

Grades. Grades in the Graduate School are as follows: *E*, *G*, *S*, *F*, and *I*. *E* (exceptional) is the highest mark; *G* (good) and *S* (satisfactory) are the remaining passing marks; *F* (failing) is an unsatisfactory grade; and *I* (incomplete) indicates that some portion of the student's work is lacking, *for an acceptable reason*, at the time grades are reported. For students enrolled in the Graduate School, the instructor who gives an *I* for a course specifies the date by which the student must make up the deficiency. For unclassified graduate students enrolled in the summer session, a temporary *I* for a course may be assigned after the student has submitted a written request that this be done. If the request is approved by the instructor of the course, then the student must satisfactorily complete the work prior to the last day of classes of the subsequent summer term. If the course is not completed in one

calendar year from the date the course ended in the case of students enrolled in the Graduate School, or by the end of the subsequent summer term in the case of unclassified graduate students, the grade of *I* becomes permanent and may not be removed from the student's record. The grade of *Z* indicates satisfactory progress at the end of the first semester of a two-semester course. A grade of *F* in a major course normally occasions withdrawal from a degree program not later than the end of the ensuing semester or term; a grade of *F* in any other course occasions academic probation.

Courses Primarily for Undergraduates. Students granted provisional admission and others whose preparation is found deficient may occasionally be required, as part of their programs, to take undergraduate courses as prerequisites to continued graduate study. Undergraduate courses thus taken and others elected by the student carry no credit toward a degree.

In exceptional cases, 100-level courses outside the major department may be taken for degree credit to a maximum of two one-semester courses or one year course not exceeding a total of 8 units, when approved by the Director of Graduate Studies in the major department and in the department in which the course is listed, and by the supervisor of the program. In order to receive credit for any such undergraduate work, the graduate student must earn a grade of at least *B*. Graduate students registering for undergraduate courses will be assessed 3 units for a nonlaboratory course and 4 units for a laboratory course.

Withdrawal from a Course. For permissible changes during the first four weeks of the fall or spring semester and during the first two weeks of a summer session term, see the section on change of registration in this chapter. If a course is dropped without the necessary approval, the permanent record will list the course as *Dropped Unofficially, F*. If a course is dropped after the four-week period during the fall or spring or after the first three days of classes during the summer, the status of the student at the time of withdrawal from the course will be determined and indicated on the permanent record as *Withdrew Passing (WP)* or *Withdrew Failing (WF)*.

Interruption of Program and Withdrawal from the Graduate School. Students are expected to meet academic requirements and financial obligations, as specified elsewhere in this bulletin, in order to remain in good standing. Certain nonacademic rules and regulations must be observed also. Failure to meet these requirements may result in dismissal by the appropriate officer of the University.

The University reserves the right, and matriculation by the student is a concession of this right, to request the withdrawal of any student whose academic performance at any time is not satisfactory to the University. A student who wishes for any reason to withdraw from the Graduate School during the fall or spring should notify in writing both the Director of Graduate Studies in the major department and the Dean of the Graduate School prior to the date of the expected withdrawal. If students wish to withdraw from the summer session, they must consult both the Dean of the school or college in which they are registered and the Director of the Summer Session. For refunds upon withdrawal, see the section on tuition and fees in the chapter "Financial Information."

A student who, after successfully completing one semester of graduate study, must withdraw before completion of a graduate program may, with the approval of the major department, request the Dean to issue a certificate of graduate study.

Leave of Absence. A leave of absence for a period of time no longer than one calendar year may be granted because of medical necessity, full-time employment at Duke University, acceptance of an external award judged likely to benefit the student as an individual but not related to the degree requirements, or other acceptable reasons. A request for a leave of absence should be originated by the student, endorsed by the student's major professor and Director of Graduate

Studies, and submitted to the Dean of the Graduate School for consideration. A student is eligible to request a leave of absence only after having completed at least one semester at Duke. Time limitations which pertain to the various degrees and the completion of courses on which a grade of *I* (incomplete) was earned are not waived.

Size and Make-up of Classes. Classes which carry graduate credit are limited in size to thirty students. In exceptional cases this regulation may be modified, but only by permission of the Dean of the Graduate School. Courses numbered from 200 through 299 may have not only graduate students enrolled, but also an unspecified number of sophomores, juniors, and seniors. Undergraduate students are not permitted to enroll in courses of 300 level or above.

Language Requirements. *Master's Degrees.* The Graduate School has no foreign language requirement for any of the master's degrees. Individual departments may, however, require foreign language proficiency. See individual departmental sections in this bulletin or contact the appropriate Director of Graduate Studies to determine specific requirements.

Ph.D. Degrees. The regulations of the Graduate School require a reading knowledge of one foreign language for the Ph.D. degree. However, some departments have been granted a waiver of the requirement, and other departments require two foreign languages. See individual department sections in this bulletin or contact the appropriate Director of Graduate Studies to determine specific requirements.

The languages usually required are French, German, or Russian. With the approval of the Director of Graduate Studies in his or her department, a student may substitute another language which has a definite relation to the degree program and for which an examination can be provided. A foreign student whose native language is not English may request that the Director of Graduate Studies in the major department ask permission of the Dean of the Graduate School to offer English for the foreign language required for the degree.

To avoid unnecessary delays, prospective students should anticipate the language requirement of their degree programs. For example, a student whose program requires a knowledge of French, German, Russian, or Spanish is urged to take the appropriate Graduate School Foreign Language Test (GSFLT) prior to registration.

Meeting the Requirement. The foreign language requirement may be satisfied in the following ways:

1. The student may take one of the GSFLT examinations administered to undergraduate and graduate students at many national centers (including Duke University Counseling and Psychological Services) prior to matriculation in the Graduate School. Enrolled students must take the GSFLT examinations administered at Duke. It should be noted, however, that at the time of the final examination in a master's program or of the preliminary examination in a doctoral program, language examinations more than six calendar years old will not be accepted toward fulfilling the language requirement.
2. With the permission of the Dean of the Graduate School, the Director of Graduate Studies may request acceptance of a language examination passed prior to the student's enrollment at Duke. The student should request that a transcript or other certification that the language examination was passed be sent to the Graduate School for approval. Requirements are (a) that only one language of a doctoral requirement be met in this way, (b) that the other institution offer a doctoral program in the student's major and the examination would have met a doctoral requirement there, and (c)

that the examination must have been passed no more than five years before first registration at Duke.

3. In a language for which GSFLT tests are not available, a reading examination may be arranged by the Graduate School office and administered by a qualified examiner.

Requirements for Foreign Students. Foreign students whose native language is not English are required to take a test for minimum competence in English. Such students, with the approval of the Director of Graduate Studies in their major department, may request permission of the Dean of the Graduate School to substitute English for the one foreign language required in the master's or doctoral program. See the section on procedures for foreign students in the chapter "Admission."

Special Language Courses. Special courses designed to assist graduate students in acquiring a reading knowledge of French or German are offered for three hours a week during the fall and spring. Special language reading courses and language courses numbered below 200 carry no credit toward a degree. Auditors are not permitted in these courses. Undergraduates may not enroll in these special courses during the academic year but may register in the summer with permission of the Dean of the Graduate School, provided space is available after graduate students have been enrolled.

Commencement

Graduation exercises are held once a year, in May, when degrees are conferred on and diplomas are issued to those students who have completed requirements by the end of the spring. Those who complete degree requirements by the end of the fall or by the end of a summer term receive diplomas dated December 30 or September 1, respectively. There is a delay in the mailing of September and December diplomas because diplomas cannot be issued until they are approved by the Academic Council and the Board of Trustees.

Standards of Conduct

Duke University expects and will require of all its students cooperation in developing and maintaining high standards of scholarship and conduct.

Students are expected to meet academic requirements and financial obligations, as specified elsewhere in this bulletin, in order to remain in good standing. Certain nonacademic rules and regulations must be observed also. Failure to meet these requirements may result in dismissal by the appropriate officer of the University.

The University wishes to emphasize its policy that all students are subject to the rules and regulations of the University currently in effect or which, from time to time, are put into effect by the appropriate authorities of the University. Students, in accepting admission, indicate their willingness to subscribe to and be governed by these rules and regulations and acknowledge the right of the University to take such disciplinary action, including suspension and/or expulsion, as may be deemed appropriate for failure to abide by such rules and regulations or for conduct adjudged unsatisfactory or detrimental to the University. University authorities will take action in accordance with due process.

Judicial Code and Procedures. In the spring of 1971, the Graduate School community ratified and adopted the following official judicial code and procedures:

I. Graduate School Judicial Code and Procedures

A. A student, by accepting admission to the Graduate School of Duke University, thereby indicates willingness to subscribe to and be governed by the rules and regulations of the University as

currently are in effect or, from time to time, are put into effect by the appropriate authorities of the University, and indicates willingness to accept disciplinary action, if behavior is adjudged to be in violation of those rules or in some way unacceptable or detrimental to the University. However, a student's position of responsibility to the authorities and the regulations of the University in no way alters or modifies responsibilities in relation to civil authorities and laws.

B. A graduate student at Duke University stands in a primary and unique relation of responsibility to the faculty in the major department, the faculty upon whose recommendation a graduate degree will or will not be awarded to the student. In matters which involve or may affect the student's intellectual or professional life, the student is directly responsible to this department and its representatives, and such matters should primarily be handled by the department.

C. Actions which appear to conflict with University-wide rules and regulations will fall under the jurisdiction of the University Judicial Board.

D. A student may elect to have the Dean of the Graduate School hear matters related to the student's conduct in addition to or instead of faculty members from the student's major department, or may elect to have such matters reviewed and judged by a judicial board instead of the Dean of the Graduate School or members of the faculty in the major department. (The constitution and procedure of the judicial board are detailed below.)

E. The Director of Graduate Studies in the student's major department may request that a student's actions be reviewed by the Judicial Board or by the Dean of the Graduate School.

II. The Graduate School Judicial Board

A. *Composition.* The Graduate School Judicial Board shall have five members, serving for a period of two years: two students selected from the student body, two members of the Graduate Faculty appointed by the Executive Committee of the Graduate School, and one Associate or Assistant Dean appointed by the Dean of the Graduate School. The Board shall elect one of its members as Chairman. The Board shall have at its service a recording secretary to keep minutes of the hearings and of the Board's actions in a permanent, confidential record book. The Board will be constituted in order to hear cases in which the accused is a student currently enrolled in the Graduate School and which have been referred to it by the Director of Graduate Studies in the student's department, by the Dean of the Graduate School, or by the student himself.

B. *Preliminary Procedures.* If a student requests a hearing by the Judicial Board it must be done in writing, allowing its Chairman at least seventy-two hours to convene the Board. In addition, the Chairman shall not convene the Board until seventy-two hours after being asked to convene the Board. It is the responsibility of the Chairman of the Judicial Board fully to inform its members concerning the case and the reasons the case has been referred to the Board; and to prepare a written summary of this information for the Board, the Dean, and the student.

C. *Procedural Safeguards for the Hearing.* The Accused has the right to challenge any member of the Judicial Board on grounds of prejudice. If the Board decides to excuse one or more of its members for reasons given by the Accused, it shall consult with the Dean about the need for replacements. The Accused may choose an Adviser to assist in the defense. The accused may also produce witnesses (including no more than two character witnesses), introduce documents, and offer testimony. A person having direct knowledge relevant to a case being heard by the Board is a material witness. The Judicial Board may request the appearance of material witnesses. The Board shall also request, upon written request of the Complainant or the Accused, the appearance of material witnesses. Witnesses shall be notified of the time, place, and purpose of their appearance. The Accused has the right to examine the written statement of any witness relevant to the case at least seventy-two hours before the hearing. The Accused has the right to be faced with any witness who has given a statement relevant to the case at the hearing if the witness's attendance can be secured.

The hearing will be conducted in private unless the Accused requests an open hearing. If any objection is raised to conducting an open hearing in any particular case, the Judicial Board shall decide the issue by majority vote. If the decision is made not to hold an open hearing, the Accused shall be informed in writing of the reasons for the decision.

The Judicial Board shall consider only the report of the Chairman, documents submitted into evidence, and the testimony of witnesses at the hearing in reaching its decisions.

D. *Conduct of the Hearing.* The hearing of any case shall begin with a reading of the charge by the Chairman in the presence of the Accused. The Accused shall then plead guilty or not guilty or move to terminate or postpone the hearing. The Accused may qualify a plea, admitting guilt in part and denying it in part. The Accused may not be questioned for more than one hour without recess.

At any time during the hearing, the Accused or the Judicial Board may move to terminate or to postpone the hearing or to qualify the plea or to modify its charge.

Pending verdict on charges (including appeal) against the Accused, status as a student shall not be changed, nor the right to be on campus or to attend classes suspended, except that the Chancellor or Provost may impose an interim suspension upon any member of the University community who demonstrates, by conduct, that continued presence on the campus constitutes an immediate threat to the physical well-being or property of members of the University community or the property or orderly functioning of the University.

E. *Sanctions and the Verdict.* The Graduate School Judicial Board shall have the power to impose the following penalties: expulsion, dismissal from the University with the recommendation that the person never be readmitted; suspension, dismissal from the University and from participation in all University activities for a specified period of time, after which the student may apply for readmission; disciplinary probation, placing the student on a probationary status for a specified period of time, during which conviction for violation of any regulation may result in more serious disciplinary action; restitution, payment for all, or a portion of property damage caused during the commission of an offense. Restitution may be imposed by itself or in addition to any of the other penalties. The Judgment shall consist of a finding of guilty or not guilty of the charge and, when the Accused is found guilty, a statement of the punishment assessed. On all questions, including the verdict and the finding of guilty or not guilty, the Board shall be governed by a majority vote. The Judicial Board may decide to rehear a case in which significant new evidence can be introduced. In addition, the defendant may request an appeal.

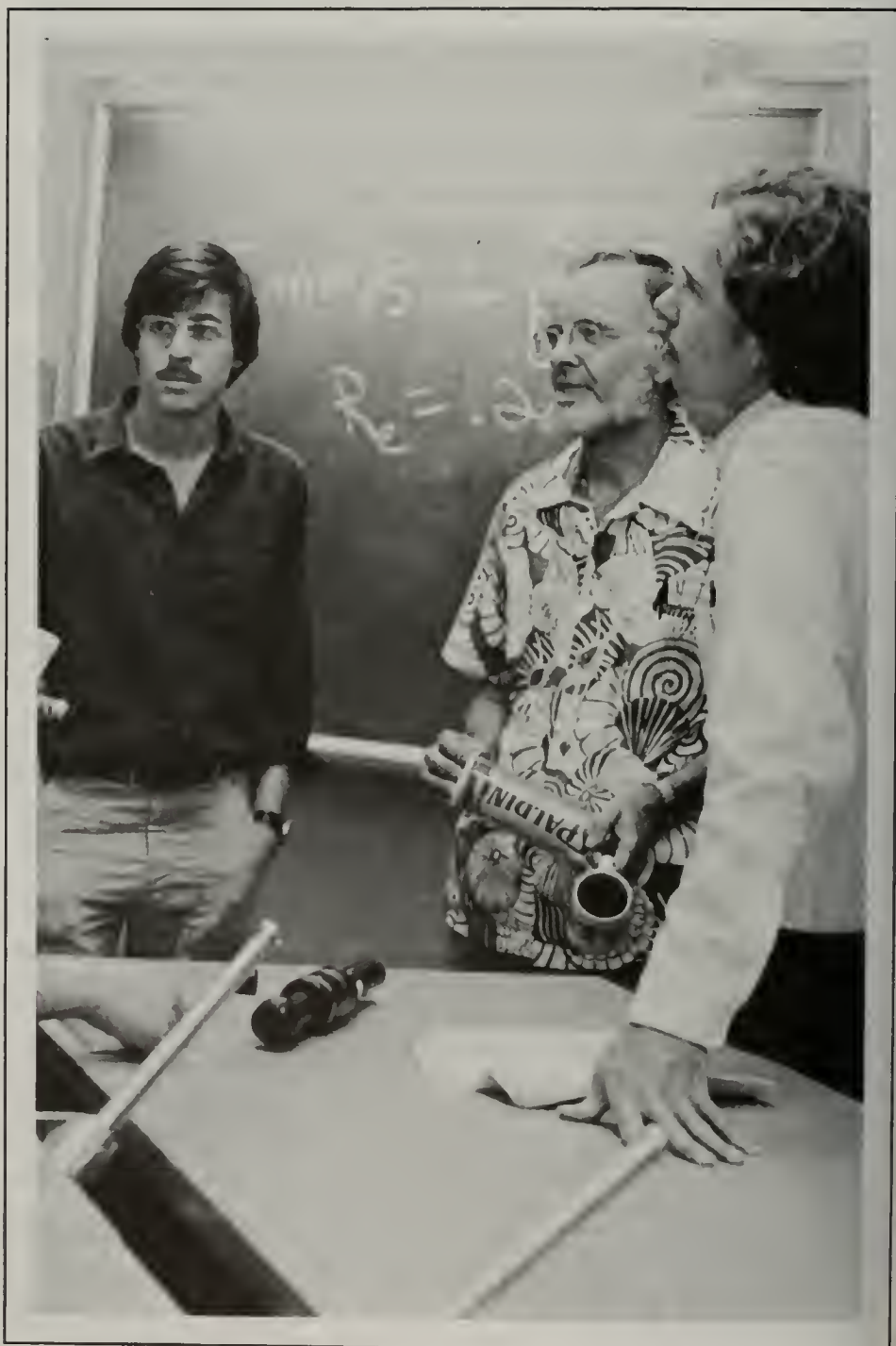
F. *Appeals.* The appellant may submit to the Dean a written statement containing the grounds for appeal and arguments. In such cases, the Dean should determine if the appeal should be granted, and the Dean can hear the case, or refer it to the appropriate faculty in the student's department or to the Judicial Board.

An appeal shall be granted on the following grounds: procedural error substantially affecting the rights of the accused; incompatibility of the verdict with the evidence; excessive penalty not in accord with "current community standards;" new evidence of a character directly to affect the judgment but on which the original tribunal had refused a new hearing.

III. Amendment and Construction

This Judicial code and procedure and this constitution and procedure for the Graduate School Judicial Board may be amended at any time with due notice or publication by consent of the Dean, the Executive Committee, and the graduate students. Questions and problems not answered or anticipated by the foregoing may be resolved by the use of other existing institutions or by amendment.

Courses of Instruction



Course Enrollment

In general, courses with odd numbers are offered in the fall semester, those with even numbers in the spring semester. Double numbers separated by a hyphen indicate that the course is a year course and usually must be continued throughout the year if credit is to be received. A student must secure written consent from the instructor in order to receive credit for either semester of a year course. Double numbers separated by a comma indicate that although the course is a year course, credit may be received for either semester without special consent. Ordinarily, courses which bear no date are offered every year.

In each department the number 399 is reserved to designate special (individual) readings in a specified area and supervised by a regular member of the graduate staff, with credit of 1-3 units each registration, only one course per registration, and 9 units maximum in three successive registrations. The course is restricted to resident master's and doctoral programs, must have a completion exercise, and must carry a grade.

The symbol *S*, suffixed to a course number, identifies that course as a seminar.

Courses taught in 1981-82 or in 1982-83, or scheduled for 1983-84, are included in this chapter with full descriptions. Additional courses, that were taught prior to 1981-82 and that are likely to be taught in the future, are listed separately by number and title.

Anatomy

Professor Robertson, *Chairman* (466 Sands); Professor Counce, *Director of Graduate Studies* (356 Sands); Professors Cartmill, Erickson, Hall, Hylander, Moses, Nicklas, and Simons; Associate Professors Corless, Kay, Longley, and Reedy; Assistant Professors Cant, Costello, Effmann, Garrett, Jakoi, Lamvik, Lin, MacPhee, Marchase, McIntosh, Schachat, Smith, and Tyrey; Professor Emeritus Everett; Associate Professor Emeritus Duke; Assistant Medical Research Professors Beall, Kopf, Magid, McCaslin, and Taylor; Lecturer Diamond

The Department of Anatomy offers graduate programs designed to produce teachers and research workers competent in a broad range of anatomical sciences; the Ph.D. degree is offered. Students with a wide variety of backgrounds and interests in the biological sciences can be accommodated. All students participate in a core of anatomical science courses (Anatomy 305, 307, 309) and gain experience in teaching over the range of departmental interests. Students are encouraged to round out their formal course work by drawing upon the offerings

of other departments in the University, as well as those in the anatomy department. Laboratories within the department are equipped for and actively support research in several areas. Some idea of the opportunities for degree research may be gleaned from the description of Anatomy 312. For further information contact the Director of Graduate Studies.

216S. Biological Psychology. (Also listed as Psychology 216S.) 3 units.
Diamond

217. Structure and Function of Visual Photoreceptors. A detailed study of available structural, biochemical, spectroscopic, and physiological data from retinal photoreceptors. Emphasis on molecular structure of vertebrate photoreceptor membranes, effects of bleaching on rhodopsin molecules, and initiation of neural information after photon absorption. Lectures, seminars, and demonstrations. Offered alternate years. Prerequisite: consent of instructor. Credit to be arranged; maximum 4 units. *Corless and McCaslin*

219. Molecular and Cellular Bases of Differentiation. A multidisciplinary approach stressing the molecular, cellular, and genetic processes involved in differentiation in eukaryotes. (Also listed as Biochemistry 219, Microbiology and Immunology 219, Pathology 219, and Physiology 230.) 3 units. *Counce and staff*

219S. Seminar. Optional seminar offered in conjunction with Anatomy 219. Students prepare and present seminar topics directly related to specific subjects discussed in Anatomy 219. Prerequisites: enrollment in Anatomy 219 and consent of instructor. 1 unit. *Staff*

220. Developmental Biology. General concepts and problems in modern developmental biology with special emphasis on cellular and subcellular events and on developmental genetics. Experimental studies in a wide range of both plant and animal species will be discussed. Intellectual continuity between early classical studies in experimental embryology and present-day developmental biology will be stressed. 3 units. *Marchase and Counce*

246. The Primate Fossil Record. (Also listed as Anthropology 246S.) 3 units.
Kay and Simons

259. Molecular Biology I: Protein and Membrane Structure/Function. See course description under the University Program in Cell and Molecular Biology. (Also listed as Biochemistry 259 and Microbiology and Immunology 259.) 3 units. *Erickson and staff*

260S. Interactions of Differentiated Cells. This course will cover basic mechanisms underlying cell-to-cell and substrate interactions of eukaryotic cells. It will consist of faculty-led discussions and informal seminars designed to evaluate critically current literature. Mitogenic responses of quiescent cells, hormonal modulation of growth and differentiation, membrane-mediated recognition phenomena in endo- and exocytosis, and the role of Golgi complex in membrane biogenesis and secretory processes are examples of topics to be covered. (Also listed as Microbiology and Immunology 260S, Pharmacology 260S, and Physiology 260S.) 2 units. *Padilla, Jakoi, Conn, and Vanaman*

269. Advanced Cell Biology. See course description under the University Program in Cell and Molecular Biology. (Also listed as Botany 269, Microbiology and Immunology 269, and Zoology 269.) 3 units. *Nicklas and staff*

270. Neurobiology I. See course description for Physiology 270. Prerequisites: Biochemistry 227 and 228 or equivalents. (Also listed as Pharmacology 270.) 3 units. *Moore and staff*

286. Electron Microscopy and Related Techniques. Lectures and laboratories on methods of ultrastructure research. Fundamentals of optics; the light

microscope, phase, polarizing, and interference microscopy. Basics of electron microscopy, staining, sectioning, and replication techniques. Optical and computer image processing. Introduction to X-ray diffraction theory and apparatus in biological structure determination. Prerequisites: calculus and one year each of physics and general chemistry and consent of instructor. 4 units. *Longley*

301. Anatomy of the Limbs. This course concentrates on the musculoskeletal anatomy of the limbs and limb girdles. Emphasis is on detailed dissection of the extremities, with a minor focus on clinical applications. Course primarily intended for advanced graduate students in physical therapy. Prerequisite: consent of instructor. Fall. 1-3 units. *MacPhee*

302. Advanced Topics and Research Seminar in Smooth and Striated Muscle. Seminars organized around current research interests of participating faculty and their laboratory associates. The goals are to provide an advanced graduate experience in muscle research topics and to provide for increased discussion and collaboration among several laboratories engaged in muscle research. Prerequisite: consent of instructors. (Also listed as Physiology 302.) 1-3 units. *Anderson, Reedy, and staff*

305. Gross Human Anatomy. Includes complete dissection of a cadaver; laboratory work is supplemented by conferences which place emphasis upon biological and evolutionary aspects. Prerequisites: adequate background in biology, including comparative anatomy and embryology and written consent of instructor. Required of entering graduate students in anatomy; by arrangement, may extend into second semester. 3 units. *Staff*

307. Microscopic Anatomy. Lectures on structural organization of different tissues and organs, as determined by light and electron microscopy with emphasis on the relation of structure to function at the cellular level. The laboratory provides practical experience with light microscopy, studying and analyzing our extensive slide collection of mammalian tissues. 3 units. *Erickson and staff*

309. Neuroanatomy. Gross and basic intrinsic anatomy of the central nervous system. Later, specific systems will be emphasized; various sensory and motor, limbic-hypothalamic, and cerebral-associated mechanisms. Clinical presentations will be offered. Prerequisites: adequate background in biology, including comparative anatomy and embryology and written consent of instructor. Required of entering graduate students in anatomy; by arrangement, may extend into second semester. 2 units. *Staff*

310. Frontiers in Neurobiology. Course consists of readings, and student and faculty presentations of current problems in neurobiology. Prerequisite: consent of instructors. 3 units. *Cant, Lin, and Hall*

311. Concepts in Cell Biology. Evaluation of models currently used to describe cell biological processes with emphasis on analysis of experimental evidence in the scientific literature. Topics include: membrane structure, cell surface interactions in development, and muscle and cell motility. 3 units. *Schachat and Jakoi*

312. Research. Individual investigations in the various fields of anatomy. Laboratories in which a student may work include: three electron microscopy laboratories headed by Moses, Reedy, and Robertson with emphasis respectively on the fine structure and cell biology of chromosomes and associated structures, molecular structure and function of muscle, and biophysical studies of cell membranes and nervous tissue; physical anthropology laboratories and the primate facility under Simons, Cartmill, Hylander, MacPhee, Kay, and Smith concentrating on biomechanics, cytogenetics, comparative anatomy, and primate

evolution and behavior; neuroanatomy laboratories under Hall, Cant, Lin, and Diamond emphasizing structural correlates of behavior and learning; neuroendocrinology laboratories under Everett and Tyrey with emphasis on brain mechanisms regulating reproductive functions of the pituitary gland; developmental and cellular biology laboratories under Counce with emphasis on developmental genetics of dipteran embryos, under Jakoi with emphasis on mechanisms for cell surface differentiation, under Marchase with emphasis on intercellular recognition and cell surface glycoprotein biogenesis, and under Schachat with emphasis on muscle biochemistry and development; and molecular structure laboratories under Longley, Erickson, Taylor, and Corless using a combination of electron microscopy, X-ray diffraction, and optical and computer methods of image analysis to study respectively fibrous proteins, microtubules, and photoreceptor membranes. Prerequisite: consent of instructor. Credit to be arranged; maximum 6 units. Staff

313, 314. Anatomy Seminar. Regular meeting of graduate students and staff in which current research problems in anatomy will be presented. 1 unit each. Staff

340. Tutorial in Advanced Anatomy. Topics for intensive reading and discussion will be chosen according to the student's interests, related to basic problems in biophysics, cytology, endocrinological control, growth and development, neuroanatomy, physical differentiation, and evolutionary origins of functional microsystems. Prerequisite: consent of instructor. Enrollment: maximum 8. Variable units. Staff

354. Research Techniques in Anatomy. A preceptorial course in various research methods in anatomy. An interested student might engage in research in one of the following: anthropology, electron microscopy, X-ray diffraction, chromosome analysis, developmental biology, primate behavior, primate anatomy, and stereotactic approaches to neuroendocrinology and neuroanatomy. Other topics may be arranged. Prerequisite: consent of instructor. Credit to be arranged. Staff

418. Reproductive Biology. The lecture material in each section of the course is followed by seminar presentations which will contribute to Anatomy 424, a corequisite for the course. (Also listed as Physiology 418.) 2 units. *Anderson, Schomberg, and Tyrey*

424. Seminar in Reproductive Biology. Can be taken independently or corequisite with Anatomy 418. (Also listed as Physiology 424.) 1 unit. *Anderson, Schomberg, and Tyrey*

COURSES CURRENTLY UNSCHEDULED

238. Functional and Evolutionary Morphology of Primates

288S. The Cell in Development and Heredity

Anthropology

Professor O'Barr, *Chairman* (03 North); Associate Professor Smith, *Director of Graduate Studies* (019 North); Professors Fox, Friedl, and Simons; Associate Professors Apte, Cartmill, Glander, Hylander, and Quinn; Assistant Professors Domínguez, Gaines, Weller, and Zagarell; Professor Emeritus La Barre; Adjunct Associate Professors Kay and Stack

The department offers graduate work leading to the Ph.D. degree in anthropology. Applicants for admission should submit scores on the Graduate Record

Examination Aptitude Test. Admission to the program is not contingent on previous anthropological course work or any other specific program of study at the undergraduate level.

The department offers a program of specialization in social/cultural anthropology and a program of specialization in physical anthropology. The emphasis of the social/cultural anthropology program is the application of a theoretical and comparative perspective to research in complex societies. Within this perspective, a wide range of interests is represented in the department. The emphasis of the physical anthropology program is primate evolution; areas of concentration include comparative morphology of human and nonhuman primates and primate social behavior.

Curriculum is tailored to the individual student's background, academic needs, and research goals; pursuit of relevant cross-disciplinary study, within and outside the department, is expected. However, a modest number of courses is required of students in both programs. Candidates for the Ph.D. degree must demonstrate competence in their chosen subfield of specialization and knowledge of the broad theoretical perspectives, from all relevant disciplines, which inform their area of concentration.

Further details of the graduate program in anthropology, the departmental facilities, the staff, and various stipends available are described in the *Guidelines for Graduate Students in Anthropology* which may be obtained from the Director of Graduate Studies, Department of Anthropology.

For Seniors and Graduates

204S. The Anthropology of Cities. Organization and behavior in urban centers from an evolutionary perspective; cross-cultural analysis of cities. Prerequisite: Anthropology 94. 3 units. *Fox or Smith*

205. The Anthropology of Anthropology. Effects of the organization and professional status of anthropological schools in the United States, Britain, and France up to World War II as they affected anthropological theory. Prerequisite: major in anthropology or graduate standing. 3 units. *Fox or Weller*

206S. Current Theoretical Schools in Anthropology. The theoretical schools since World War II, including cultural materialism and neo-Marxism, structuralism, cognitive anthropology, cultural analysis and symbolic anthropology, transactional analysis, and sociobiology. Prerequisite: Anthropology 94 or graduate standing or permission of instructor. 3 units. *Apte, Fox, Gaines, Smith, or Weller*

211S. Ethnography of Communication. History of the mutual influence of linguistics and anthropology leading to the development of ethnography of speaking, ethnoscience, structuralism, and sociolinguistics. Topics vary each semester. Prerequisite: Anthropology 111 or 119 or consent of instructor. 3 units. *Apte, O'Barr, or Weller*

215S. Gender Roles in Cross-Cultural Perspective. Theories of gender roles and of their relationships to kinship, marriage, inequality, and politics. 3 units. *Domínguez, Quinn, or Smith*

228S. Slavery and Society. Western and non-Western systems of slavery and their effects on social organization, self-concepts, and race relations. 3 units. *Domínguez*

234S. Political Economy of Development: Theories of Change in the Third World. See course description for Political Science 234S. (Also listed as History 234S and Sociology 234S.) 3 units. *Bergquist, Gereffi, Smith, and Valenzuela*

237S. Interpretations of Kinship. The major interpretations of kinship in social organization. 3 units. *Domínguez or Quinn*

239. Culture and Ideology. Major theories about the relationship between ideologies and social/economic systems. Readings from the works of Marx, Weber, Gramsci, Althusser, Geertz, and others. 3 units. *Weller*

241. The Rise of Civilization in Mesopotamia and Iran. An introductory survey of the major stages of developments from the beginnings of agriculture to the collapse of the early state-system (10,000-1,800 B.C.E.). Archaeological and textual evidence, focusing on the rise of the Mesopotamian state-system, the nature of that system, and the mechanisms leading to its collapse. 3 units. *Zagarell*

243S. Theory and Method in Archaeology. Techniques of geochronology, environmental reconstruction, sociocultural reconstruction, and statistical analyses applied to problem areas in archaeology. Prerequisite: Anthropology 166 or consent of instructor. 3 units. *Zagarell*

244S. Primate Behavior. Social behavior of prosimians, monkeys, and apes and the evolutionary development of primates. 3 units. *Glander*

246S. The Primate Fossil Record. Evolution of humans and other primates as inferred from fossil remains. Prerequisite: a course in human evolution or consent of instructor. (Also listed as Anatomy 246.) 3 units. *Cartmill, Kay, or Simons*

251. Ethnography of Humor. Examination of theoretical framework, research methods, and data collection techniques for the analysis of humor with the goal of discerning normative behavioral patterns, expectations regarding social roles, interpersonal relationships and social institutions, and the nature of ideologies and world views, within and across cultures. Prerequisite: Anthropology 94 or consent of instructor. 3 units. *Apte*

255. Ethnopsychiatry, Ethnomedicine, and Cross-Cultural Psychiatry. In-depth consideration of these and other topics in medical anthropology. Topics vary each semester. Prerequisite: Anthropology 145 or 165 or consent of instructor. 3 units. *Gaines*

258S. Symbols in Society. Symbolic action and expressive culture among tribal, peasant, and industrial societies. Approaches emphasized are functionalism, symbolic interaction, structuralism, and cultural interpretation. 3 units. *Gaines or Weller*

267. Cognitive Anthropology. Culturally shared systems for categorizing, decision making, information processing, and performing other cognitive tasks. Prerequisite: Anthropology 165 or consent of instructor. 3 units. *Quinn*

275S. Inequality in Precapitalist Societies. The nature and transformation of political and economic power differentials with attention to differential power based on sex, age, or rank in social formations where property is corporately owned. 3 units. *Fox or Smith*

280S, 281S. Seminar in Selected Topics. Special topics in methodology, theory, or area. Prerequisite: consent of instructor. 6 units. *Staff*

282S. Canada. See course description for History 282S. (Also listed as Economics 282S, Political Science 282S, and Sociology 282S.) 3 units. *Leach and visitors*

For Graduates

330S, 331S. Theories in Sociocultural Anthropology. A two-semester seminar in anthropological theory, in which the modern currents and debates in the field are examined and discussed. Particular topics to be chosen by the instructors. 6 units. *Staff*

393. Individual Research in Anthropology. A course for the student preparing the A.M. thesis or the Ph.D. dissertation. Supervision and guidance of intensive research on a problem approved by the student's departmental advisory committee. 3 units. *Staff*

COURSES CURRENTLY UNSCHEDULED

256. Topics in Psychological Anthropology

273S. Precapitalist Modes of Production and Exchange

274S. Inequality in Peripheral Capitalist Societies

334. Topics in Physical Anthropology

Art

Professor Spencer, *Director of Graduate Studies* (112A East Duke); Associate Professor Goffen; Assistant Professors Bruzelius, Epstein, and Shapiro; Professor Emeritus Markman

Graduate work in the Department of Art is offered leading to the A.M. degree in art history and is designed to provide basic training in the history of art with specialization in a given field selected by the student after consultation with and approval of the Director of Graduate Studies. Prospective students should present a minimum of 24 semester hours of undergraduate work in the history of art. In special cases a student who does not fulfill this prerequisite may be required to attend prescribed undergraduate courses. A reading knowledge of one foreign language (preferably German) is required; candidates who do not meet this requirement upon admission to the program are expected to do so by the end of their first term in residence.

The program for the A.M. degree in art history consists of 30 units as follows: 12 units in art history; 6 units in an approved minor; 6 units in the major or minor, or other approved subject; and 6 units in thesis. A written thesis is required. Candidates must also pass written comprehensive examinations testing their knowledge of art history and pertinent bibliographical resources.

For Seniors and Graduates

220S. Greek Painting. Prerequisite: consent of instructor. (Also listed under Classical Studies 232S.) 3 units. *Bruzelius or Stanley*

230S. Medieval and Byzantine Art and Architecture. Conceptual, institutional, or stylistic topics. Subject varies from year to year. Prerequisite: consent of instructor. (Also listed under Medieval and Renaissance Studies.) 3 units. *Bruzelius or Epstein*

232S. Romanesque and Gothic Art and Architecture. Analysis of an individual topic. Subject varies from year to year. Prerequisite: consent of instructor. (Also listed under Medieval and Renaissance Studies.) 3 units. *Bruzelius*

240. Italian Art. Examination of an individual artist, a particular movement, or the art of an Italian city. Subject varies from year to year. (Also listed under Medieval and Renaissance Studies.) 3 units. *Goffen or Spencer*

242S. Studies in Italian Renaissance Art. Specific problems dealing with iconography, style, or an individual master from ca. 1300 to 1600. Subject varies from year to year. Prerequisite: consent of instructor. (Also listed under Medieval and Renaissance Studies.) 3 units. *Goffen and Spencer*

262S. Problems in Nineteenth-Century Art. 3 units. *Shapiro*

257S. Problems in Modern Art. Selected topics in modern art before 1945, with emphasis on major movements or masters. Prerequisite: consent of instructor. 3 units. *Higdon or Shapiro*

277S. Contemporary Art. Historical and critical principles applied to present-day artists and/or movements in all media since World War II. 3 units. *Higdon or Shapiro*

279S. Problems in Modern Architecture. A particular movement, master, or idea studied as a problem in criticism and methodology; influence on design and building. Prerequisite: Art 62 or consent of instructor. 3 units. *Staff*

293S. Methods in Art History. Approaches to the study of works of art, including connoisseurship, iconology, and stylistic analysis. Open to art majors, seniors, and qualified juniors only. 3 units. *Staff*

294, 295. Special Problems in Art History. Individual study and research. 6 units. *Staff*

COURSES CURRENTLY UNSCHEDULED

253. Spanish Baroque Painting

281S. Problems in Pre-Columbian Art and Archaeology

282S. Problems in Latin-American Art

Asian Languages

The courses are offered as an enrichment for students interested in the South Asian subcontinent and may be taken as a general elective by advanced undergraduate students. No major work is offered in Hindi-Urdu.

COURSES CURRENTLY UNSCHEDULED

Hindi-Urdu 200-201. Special Studies in South Asian Languages

Hindi-Urdu 203. Studies in Commonwealth Literature

For courses in Chinese and Japanese, see *Bulletin of Duke University: Undergraduate Instruction*.

Biochemistry

Professor Hill, *Chairman* (255 Nanaline H. Duke); Associate Professor Siegel, *Director of Graduate Studies* (252 Nanaline H. Duke); Professors Fridovich, Gross, Guild, Kamin, Kirshner, McCarty, Rajagopalan, and Webster; Associate Professors Bell, Greene, Kaufman, Lynn, Modrich, Richardson, Sage, and Sullivan; Assistant Professors Greenleaf, Habig, Hershfield, Holmes, Hsieh, Kredich, Lefkowitz, McKee, Pizzo, Roses, Steege, and Wheat; Assistant Medical Research Professors C. Bonaventura and J. Bonaventura; Associates Bittikofer and Nozaki

Graduate work in the Department of Biochemistry is offered leading to the Ph.D. degree. Preparation for such graduate study may take diverse forms. Undergraduate majors in chemistry, biology, mathematics, or physics are welcome, but adequate preparation in chemistry is essential. Graduate specialization areas include protein structure and function, crystallography of macromolecules, nucleic acid structure and function, lipid biochemistry, membrane structure and function, molecular genetics, enzyme mechanisms, and neurochemistry. The Division of Genetics of the department, in cooperation with the University Program in Genetics, offers biochemistry students the opportunity to pursue advanced research and study to fulfill the requirements for the Ph.D. degree.

200. General Biochemistry. An introductory survey of fundamental aspects of biochemistry with emphasis on the structure of macromolecules, mechanism of enzyme action, metabolic pathways, biochemical genetics, and the structure and functions of special tissues. Designed for medical students; graduate students only with consent of instructor. 4 units. *Hill and staff*

209-210. Independent Study. A tutorial designed for students who are interested in either a laboratory or a library project in biochemistry. Credit to be arranged. *Staff*

215. Genetic Mechanisms. Genetic mechanisms in molecular terms emphasizing gene function, segregation, and regulation in procaryotes and eucaryotes. Systems covered include bacterial viruses, bacteria, plasmids, cellular organelles, and selected lower and higher eucaryotes. Prerequisite: introductory biochemistry. Course material will be drawn from original literature. (Also listed under the University Program in Genetics.) 3 units. *Gross and staff*

219. Molecular and Cellular Bases of Differentiation. See course description for Anatomy 219. (Also listed as Microbiology and Immunology 219, Pathology 219, and Physiology 230.) 3 units. *McCarty and staff*

219S. Seminar. Optional seminar in conjunction with Biochemistry 219. *McCarty*

220L. Adaptations of Organisms to the Marine Environment. Introduction to basic concepts of biochemistry and to variables in the marine environment which evoke adaptive responses. Specific adaptations at the molecular level. Biological fitness from a biochemical viewpoint. Prerequisites: introductory biology and organic chemistry and consent of instructor. (Also listed as Marine Sciences 220L.) Offered at Beaufort. 4 units. *C. Bonaventura and J. Bonaventura*

220S. Adaptations of Organisms to the Marine Environment. 2 units. *C. Bonaventura or J. Bonaventura*

222. Structure of Biological Macromolecules. Introduction to the techniques of structure determination by X-ray crystallography and study of some biological macromolecules whose three-dimensional structures have been determined at high resolution. 2 units. *Richardson*

224. Biochemistry of Development and Differentiation. The course represents an extension of topics covered in the first semester course, Biochemistry 219. Emphasis will be on the control of transcription and translation of messenger RNA in mammalian cells. These studies include gene amplification, postsynthetic modifications of chromosomal proteins, as a result of hormone induction. Specific systems will include the development of the mammary gland, the pancreas, and the chick oviduct. 2 units. *McCarty*

227. Introductory Biochemistry I: Intermediary Metabolism. Prerequisite: organic chemistry. (Also listed as Botany 227.) 3 units. *Staff*

228. Introductory Biochemistry II: Biological Macromolecules. Prerequisite: Biochemistry 227 or equivalent. (Also listed as Botany 228.) 3 units. *Greenleaf and Webster*

245L. Macromolecules, Ecology, and Evolution. The structure and function of protein and nucleic acid molecules with particular emphasis on the application of molecular techniques to questions in ecological, systematic, and evolutionary theory. One course. 3 units. *Sullivan*

259. Molecular Biology I: Protein and Membrane Structure/Function. See course description under the University Program in Cell and Molecular

Biology. (Also listed as Anatomy 259 and Microbiology and Immunology 259.) 3 units. *Staff*

265S, 266S. Seminar. Topics and instructors announced each semester. (Also listed under Marine Sciences.) 2 units or variable. *Staff*

268. Molecular Biology II: Nucleic Acids. See course description under the University Program in Cell and Molecular Biology. (Also listed as Botany 268 and Microbiology and Immunology 268.) 3 units. *Modrich and staff*

276. Comparative and Evolutionary Biochemistry. Lectures and discussion of the origin of life, evolution of genetic code, mutation and protein polymorphism, natural selection and protein structure, and comparison of homologous proteins and nucleic acids. Laboratory work involves the purification and characterization of homologous proteins from fish and invertebrates. Techniques include salt fractionation, electrophoresis, ion-exchange and molecular exclusion chromatography, fingerprinting, molecular weight determination, amino acid composition, and other related approaches. Prerequisite: consent of instructor. Offered at Beaufort. (Also listed as Marine Sciences 276.) 6 units. *Sullivan*

286. Current Topics in Immunochemistry. The structure, function, and specificity of antibodies. Immunogenicity and tolerance with special emphasis on current theories of the diversity and synthesis of antibody molecules. 2 units. *Sage*

288. The Carbohydrates and Lipids of Biological Systems. The subjects will be considered in the following two general categories: (a) the relationship between chemical structure and biological function, and (b) biosynthesis and catabolism. 2 units. *Kaufman*

291. Physical Biochemistry. Principles of thermodynamics, hydrodynamics, spectroscopy, and X-ray diffraction and scattering are applied to biological systems. Biological molecules and macromolecules in both soluble and crystalline states are discussed. Prerequisite: undergraduate physical chemistry, including solution thermodynamics, kinetics, introductory quantum mechanics, and introductory crystallography. 3 units. *Richardson and staff*

296. Biological Oxidations. A lecture, conference, and seminar course on the mechanism of electron transport and energy conservation in purified enzymes and in organized systems such as the mitochondrion, the endoplasmic reticulum, and the chloroplast. 2 units. *Kamin and staff*

297. Intermediary Metabolism. Lectures and student presentations on selected topics in the areas of metabolic regulation, bioenergetics, and other subjects of current research interest in metabolism. 3 units. *Siegel and staff*

299. Nutrition. This course examines the experimental basis for the identification and quantification of requirements for calories, macronutrients, and micronutrients (vitamins and minerals); the biochemistry of nutrition with the assessment of nutriture; and the biological effects of deficiency or excess of nutrients. The course seeks to define optimal nutriture and will search for factual bases for common beliefs on nutrition of individuals and populations. Informal lectures and, if possible, student seminars. Prerequisite: a basic biochemistry course or equivalent or consent of instructor. 2 units. *Kamin*

345, 346. Biochemistry Seminar. Required of all biochemistry students. 1 unit each. *Guild and Richardson*

347, 348. Seminar in Toxicology. A weekly research seminar throughout the year is required of participants in the toxicology program. Students, faculty, and invited speakers present their findings. (Also listed as Pharmacology 347, 348.) 1 unit per semester. *Lynn and Abou-Donia*

Botany

Professor White, *Chairman* (149 Biological Sciences); Associate Professor Searles, *Director of Graduate Studies* (257 Biological Sciences); Professors Antonovics, Barber, Boynton, W. Culberson, Hellmers, Johnson, Naylor, Philpott, Stone, Strain, and Wilbur; Associate Professors Christensen, Knoerr, Ramus, and Siedow; Assistant Professor Schlesinger; Professors Emeriti Anderson, Billings, and Kramer; Adjunct Professor C. Culberson; Adjunct Assistant Professor Patterson

Graduate work in the Department of Botany is offered leading to the A.M. (nonthesis), M.S. (thesis), and Ph.D. degrees. Before undertaking graduate study in botany a student should have had in the undergraduate program at least 12 semester hours of botany beyond an elementary course, and related work in biological sciences. Some work in chemistry and physics will be desirable and, for some phases of botanical study, a necessity. The student's graduate program is planned to provide a broad basic training in the various fields of botany, plus intensive specialization in the field of the research problem.

209L. Lichenology. Morphology, systematics, and biological and ecological implications of the lichens. Collection and identification of specimens and the use of lichen chemistry in taxonomy. 3 units. *W. Culberson and C. Culberson*

212L. Phycology. Morphological and ecological characteristics of common freshwater and marine algae and principles of their classification. 4 units. *Searles*

215L. Primary Productivity in the Seas. The biological flux of carbon in the coastal and open seas involving phytoplankton, seaweeds, seagrasses, and marsh-grasses. The contributions of these primary producers to food chain processes and global atmospheric-sedimentary cycles, as well as the ecological consequences of variations in photosynthetic mechanisms. Prerequisites: introductory biology and introductory chemistry. Offered at Beaufort. (Also listed as Marine Sciences 215L and Zoology 215L.) 4 units. *Barber and Ramus*

218. Barrier Island Ecology. Adaptation of plants to barrier island migration and other physical characteristics of the coastal environment. Major emphasis on management of barrier beaches from Maine to Texas and the impact of human interference with natural processes. Field studies. Prerequisite: a course in general ecology. Offered at Beaufort. (Also listed as Marine Sciences 218.) 6 units. *Staff*

219L. Benthic Marine Algae. Morphology, reproduction, life histories, systematics, and natural history of seaweeds. Lectures, laboratories, and field work in ocean and estuaries. Prerequisite: introductory biology; plant diversity recommended. Offered at Beaufort. (Also listed as Marine Sciences 219L.) 4 units. *Searles*

221L. Mycology. Field and laboratory study of vegetative and reproductive structures of the fungi and slime molds. Methods of collection, isolation, propagation, and identification of the major orders as represented in local flora. Prerequisite: one year of biological science. 4 units. *Johnson*

225T, 226T. Special Problems. Students with adequate training may do special work in the following fields. Credit to be arranged. 1 to 4 units.

2. Genetics. *Antonovics*
4. Phycology. *Ramus*
5. Genetics. *Boynton*
6. Ecology. *Christensen*
7. Lichenology. *W. Culberson*
8. Physiology. *Hellmers*

9. Bacteriology; Mycology. *Johnson*
10. Physiology. *Naylor*
11. Anatomy and Morphology of Vascular Plants. *Philpott*
12. Phycology. *Searles*
13. Systematics of Flowering Plants. *Stone*
14. Ecology. *Strain*
15. Anatomy and Morphology of Vascular Plants. *White*
16. Systematics and Taxonomy of Vascular Plants. *Wilbur*
17. Physiology. *Siedow*
18. Biological Oceanography. *Barber*
19. Ecology. *Schlesinger*

227. Introductory Biochemistry I: Intermediary Metabolism. Chemistry of the constituents of proteins, lipids, carbohydrates, and nucleic acids and their metabolic interrelationships. Prerequisite: organic chemistry. (Also listed as Biochemistry 227.) 3 units. *Staff*

228. Introductory Biochemistry II: Biological Macromolecules. Prerequisite: Botany 227 or equivalent. (Also listed as Biochemistry 228.) 3 units. *Greenleaf and Webster*

232. Microclimatology. (Also listed as Forestry and Environmental Studies 232.) 3 units. *Knoerr*

242L. Systematics. Principles of vascular plant taxonomy, with practice in identification of the local flora. Lectures, laboratories, and field trips. Prerequisite: one year of biology. 4 units. *Wilbur*

243S. Classification of Angiosperms. The characteristics and phylogenetic relationships of large and important families of angiosperms with emphasis upon the systems of Cronquist and Thorne. Prerequisite: Botany 142L or equivalent. 3 units. *Wilber*

244L. Diversity of Plants. Surveys major groups of living plants with emphasis on algae, bryophytes, and vascular plants. Field observations and collections stress coastal botany and provide a basis for independent projects. Not open to students who have had Botany 145L. Prerequisite: introductory biology. Offered at Beaufort. (Also listed as Marine Sciences 244L.) 6 units. *Staff*

245L. Plant Diversity. Major groups of the living plants; their evolutionary origins and phylogenetic relationships. Prerequisite: introductory biology. 4 units. *W. Culbertson and White or Searles and Wilbur*

246L. Ecology of Plants. Principles of the relationships between plants and their environments. Structures and processes of ecosystems. Laboratory, lectures, and field trips. Prerequisites: introductory biology and one other course in biology. 4 units. *Christensen, Schlesinger, or Strain*

247L. Plant Ecology. Principles of the relationships between plants and their environments. Emphasis on structures and processes of coastal plain ecosystems. Not open to students who have had Botany 246L. Prerequisite: introductory biology. Offered at Beaufort. 6 units. *Staff*

250L,S. Plant Biosystematics. Descriptive and experimental procedures used to assess systematic implications of vascular plant evolution. Laboratory, discussion, and field-oriented problems. Prerequisites: basic courses in systematics and genetics. 4 units. *Stone*

251L. Plant Physiology. The principal physiological processes of plants including respiration, photosynthesis, water relations, and factors associated with plant morphogenesis. Prerequisites: introductory college biology and one year of chemistry; organic chemistry is desirable. 4 units. *Siedow*

253. Biophysical Plant Physiology. Application of physical principles to such processes as ion transport, water relations, and the interconversion of energy

in plant cells. Prerequisites: Botany 151L and Mathematics 32 or equivalent. 3 units. *Siedow*

258. Physiology of Growth and Development. Consideration of the internal factors and processes leading to the production of new protoplasm and its differentiation at the cellular, tissue, and organ level in plants. Lectures. Prerequisite: Botany 151L or equivalent; organic chemistry is recommended. 3 units. *Naylor*

260L. Plant Anatomy. A comparative study of basic cell types, tissues, and organs of vascular plants. Correlation of anatomical information with pertinent literature, application of anatomy to problems in systematics and evolution, and the interrelationship between structure and function. Prerequisite: one year of biology or consent of instructor. 4 units. *Philpott and White*

261. Photosynthesis. Principles of plant photosynthesis: developmental, mechanistic, regulatory, and ecological aspects of the photosynthetic process. Prerequisite: Botany 151L or 251L. 3 units. *Naylor or Siedow*

263L. Tropical Seaweeds. Collection, preservation, description, identification, illustration, and descriptive ecology. Two-week field study on Andros Island in the Bahamas. Prerequisite: Botany 145L or equivalent or consent of instructor. 2 units. *Searles*

265. Physiological Plant Ecology. The physiological approach to interpreting adaptation in plants, with emphasis on terrestrial seed plants. Prerequisites: Botany 146L and 151L or equivalents. 3 units. *Strain*

265L. Physiological Plant Ecology. See Botany 265. Lectures and laboratories. 3 units. *Strain*

267L. Plant Community Ecology. Concepts and methods of plant synecology. Introduction to the plant communities of North Carolina. Prerequisites: Botany 142L and 146L or equivalents and consent of instructor. 3 units. *Christensen*

268. Molecular Biology II: Nucleic Acids. See course description under the University Program in Cell and Molecular Biology. (Also listed as Biochemistry 268 and Microbiology and Immunology 268.) 3 units. *Modrich and staff*

269. Advanced Cell Biology. See course description under the University Program in Cell and Molecular Biology. (Also listed as Anatomy 269, Microbiology and Immunology 269, and Zoology 269.) 3 units. *Endow and staff*

272. Ecosystem Analysis. Current problems and progress in studies of terrestrial ecosystems and the biosphere, including energy flow and mineral cycling processes. Prerequisite: Botany 146L. 3 units. *Schlesinger*

280. Principles of Genetics. (Also listed as Zoology 280 and under the University Program in Genetics.) 3 units. *Antonovics, Boynton, and Gillham (zoology)*

283. Extrachromosomal Inheritance. Genetics, biochemistry, and molecular biology of the organelles of eukaryotic cells, bacterial plasmids and erisomes, and cellular symbionts. Emphasis on recent literature. Prerequisite: introductory genetics. (Also listed as Zoology 283 and under the University Program in Genetics.) 3 units. *Boynton and Gillham (zoology)*

285S. Ecological Genetics. Interaction of genetics and ecology and its importance in explaining the evolution, diversity, and distribution of plants and animals. Prerequisites: Botany 180 and 286 or equivalents. (Also listed under the University Program in Genetics.) 3 units. *Antonovics*

286. Evolutionary Mechanisms. Population ecology and population genetics of plants and animals. Fitness concepts, life history evolution, mating systems,

genetic divergence, and causes and maintenance of genetic diversity. Prerequisite: genetics. (Also listed as Zoology 286 and under the University Program in Genetics.) 3 units. *Antonovics and H. Wilbur (zoology)*

293L. Population Biology. Theoretical approach to population genetics, life table mathematics, life cycle evolution in plants and animals, population dynamics, and regulation. Laboratories emphasize experimental methods. Individual projects and weekend field trips. Prerequisites: calculus, ecology, and consent of instructor. (Also listed as Zoology 293L.) 3 units. *Antonovics and H. Wilbur*

295S, 296S. Seminar. Credit to be arranged. *Staff*

300. Tropical Biology: An Ecological Approach. Highly intensive, field-oriented course conducted in Costa Rica under auspices of the Organization for Tropical Studies. For additional information refer to the chapter "Special and Cooperative Programs." 6 to 8 units. *Staff*

330L. Environmental Monitoring and Instrumentation. Methods of measuring and monitoring the earth's physical environment with emphasis on water and air resources. Characteristics and uses of contemporary sensors, measurement and data acquisition systems. Methods of obtaining and processing computer compatible data records. Prerequisite: consent of instructor. (Also listed as Forestry and Environmental Studies 330L.) 4 units. *Knoerr*

359, 360. Research in Botany. Individual investigation in the various fields of botany. (Also listed as Marine Sciences 359, 360.) Credit to be arranged. *All members of the graduate staff*

The University Program in Genetics. Genetics courses offered by the botany department are an integral part of this interdepartmental program. Refer to the announcement in this bulletin under the University Program in Genetics for descriptions of the following courses: 215. Molecular Genetics; 264S. Chromosomes, DNA, and Evolution; 285S. Ecological Genetics; 286. Evolutionary Mechanisms; 336. Immunogenetics; 350. Genetics Colloquium.

Program in Tropical Biology. Fellowships are available for travel and subsistence in field-oriented programs in Central America. Refer to the section on Organization for Tropical Studies in the chapter "Special and Cooperative Programs."

The University Program in Marine Sciences. Interdisciplinary programs emphasizing marine botany are available. Refer to the section on Marine Sciences—The University Program.

COURSES CURRENTLY UNSCHEDULED

204L. Marine Microbiology

210L. Bryology

344. Micrometeorology and Biometeorology Seminar

Business Administration

Thomas F. Keller, Ph.D., *Dean* (115 Social Sciences); Associate Professor Payne, *Director of Graduate Studies* (02E Social Sciences); Professors Baligh, Bettman, Blaydon, Cohen, Forsyth, Hamner, Laughhunn, Lewin, Morey, Peterson, Staelin, Vander Weide, and Viscusi; Associate Professors Battle, Burton, Capettini, Dellinger, Dittman, Huber, Hughes, Lewicki, McCann, Magat, Maier, Rendleman, Schmenner, and Vaupel; Assistant Professors Burke, Conroy, Cox, Edell, Gardner, Hekman, Karwan, Ricks, Schuette, Sheppard, and Tsui

The Ph.D. in Business Administration program prepares candidates for research and teaching careers at leading educational institutions and for careers in business and governmental organizations where advanced research and analytical capabilities are required. The Ph.D. program places major emphasis on independent inquiry, on the development of competence in research methodology, and on the communication of research results.

The program requires that doctoral candidates must acquire expertise in three disciplines: economics, behavioral science, and quantitative methods. In addition, each candidate must acquire knowledge at the M.B.A. level of at least three of the following functional areas: accounting, finance, marketing, and operations management. Competence in the three disciplines and the functional areas may be gained from the student's choice of course work, participation in seminars, and independent study. Each student takes a comprehensive examination at the end of the second year or at the beginning of the third year of residence. The final requirement is the presentation of a dissertation. The Ph.D. program usually requires three to four years of work beyond the bachelor degree. Students entering the program with an M.B.A. or other advanced work will usually be able to reduce the time in residence by a year.

Refer to the *Bulletin of Duke University: The Fuqua School of Business* for a complete list of courses and course descriptions.

521. Organization Seminar: A Micro Focus. Individual and small group behavior in organizations. Theories of motivation, decision making, interpersonal behavior, group processes, and leadership. A variety of research approaches and methods includes presentation of behavioral research by members of the Fuqua School of Business and other researchers. 3 units. *Staff*

522. Organization Seminar: A Macro Focus. The organization and the subunits which make up the organization. Theories of organization, structure, decentralization, divisionalization, functional area integration, task design, incentives and rewards, information systems, and decision rules are developed with an orientation toward their choice and design for high performance. Includes presentation of research by members of the Fuqua School of Business and other researchers. 3 units. *Staff*

531. Financial Accounting Seminar. The nature of published financial statement information and its relationship with various economic variables. The list of related variables might include stock market data, bankruptcy filings, and the actions of various users of financial statement information, including management, investors, creditors, and regulators. The focus is on the current research methodologies and research efforts used to analyze the above relationships. A background in masters level accounting and finance is assumed. 3 units. *Staff*

532. Management Accounting Seminar. Information systems and their use in facilitating management decision making and organizational control. Emphasis on the appropriate research methodologies and paradigms including information economics, decision theory, and organizational theory. Topics include budgeting, incentive systems/performance evaluation, variance investigation, and cost allocation. 3 units. *Staff*

551. Corporate Finance Seminar. Introduction to research areas in corporate finance. Emphasis on the research interests of the instructor, and one of the following topics to be explored in depth: capital budgeting, capital structure, mergers and acquisitions, international finance, and cash management. 3 units. *Staff*

552. Investment Seminar. Survey of research in the investment area and exploration in depth of one or more problems in which research is currently active.

Emphasis determined by the instructor from one or more of the following areas: valuation of risky securities, capital asset pricing model and extensions, capital market efficiency, portfolio theory, options and warrants, investment management, and futures contracts. 3 units. *Staff*

561. Seminar in Quantitative Research in Marketing. An overview of the quantitative techniques which are important in marketing research. Each model and technique will be examined in considerable detail so as to permit an understanding of its assumptions, structure, and usefulness. Topics covered will include the general data analysis techniques as well as models from advertising, new products, and pricing decisions. 3 units. *Staff*

562. Seminar in Behavioral Models in Marketing. Examines the development of research in consumer behavior. Major emphasis is given to theoretical developments and empirical research. Students are expected to formulate and test a framework or model of consumer behavior with respect to a marketing problem or topic. 3 units. *Staff*

571. Operations Strategy Seminar. Recent developments in the strategy of operations in both the manufacturing and service sectors. Topics include the focused factory concept, Japanese manufacturing philosophy, technological policy toward new process development and toward new product introduction, vertical integration, choice of capacity and location, industry analysis, and the impact of government regulation. Emphasis on the development of hypotheses about strategic topics and the empirical means by which they can be tested. 3 units. *Staff*

572. Seminar in Operational and Technological Tactics. Current issues in the day-to-day management of manufacturing and service delivery systems. Topics include material requirements planning, capacity requirements planning, quality of work life projects, productivity measurement and enhancement, implementation of new product introductions and production process modifications, quality assurance, production planning and scheduling, and logistics. Concentration on the substance of recent developments, the generation and test of hypotheses about tactical issues, and the applicability of various optimization techniques to the advance of operation tactics. 3 units. *Staff*

COURSES CURRENTLY UNSCHEDULED

309.1-9. Research in Managerial Economics

319.1-9. Research in Quantitative Methods

329.1-9. Research in Organization Theory and Management

339.1-9. Research in Information and Accounting Systems

349.1-9. Research in Public Policy and Social Responsibility

359.1-9. Research in Finance

369.1-9. Research in Marketing

379.1-9. Research in Production

392-393. Tutorial in Interdisciplinary Areas

397. Dissertation Research

The University Program in Cell and Molecular Biology

Program Administration: Professor Hill, *Director* (biochemistry); Associate Professor Kaufman, *Associate Director* (biochemistry); Professors Lauf (physiology), Nicklas

(zoology), Pizzo (pathology), and Vanaman (microbiology and immunology); Associate Professors Modrich (biochemistry) and Siedow (botany); Assistant Professors Conn (pharmacology) and Marchase (anatomy)

Faculty: A complete list of faculty, including research interests, will be made available to prospective students.

Research training in cell, developmental, and molecular biology is found in eight departments at Duke University: anatomy, biochemistry, botany, microbiology and immunology, pathology, pharmacology, physiology, and zoology. To effectively utilize this broad spectrum of expertise for the training of promising, young scientists while still providing a coherent curriculum, the Duke University Program in Cell and Molecular Biology has been established.

During the first year of doctoral study a student will complete the program's three-course sequence presenting current understanding and research activities in cell biology and the molecular biology of nucleic acids, proteins, and membranes. Each student will also affiliate with a department, fulfill departmental requirements, and choose elective courses in an area of specialization. Research training is stressed throughout the program and dissertation research usually begins by the third semester. Normally the dissertation adviser will be chosen from within the student's own department but, depending on the student's research interests, dissertation research with an adviser in another department may be approved.

Prospective students may apply directly to the Cell and Molecular Biology Program or to one of the eight participating departments. Those who apply to the program must also designate a departmental preference. Applicants must have demonstrated, in addition to overall academic excellence, a proficiency in the biological and physical sciences. Applications for admission and fellowship support must be received by February 1, but early applications may receive earlier consideration.

259. Molecular Biology I: Protein and Membrane Structure/Function. Detailed concepts of the structure and function of proteins as enzymes and as structural elements of cellular substructures, including: protein primary structure and its determination, patterns of protein folding, mechanisms of enzyme catalysis and regulation, function and formation of multimeric protein assemblies, proteins and other constituents of biological membranes. Prerequisite: introductory biochemistry or consent of instructor. (Also listed as Anatomy 259, Biochemistry 259, and Microbiology and Immunology 259.) 3 units. *Vanaman and staff*

264. Cell and Molecular Biology Seminar. Required of all students. Third- and fourth-year students discuss their dissertation research. 1 unit. *Staff*

268. Molecular Biology II: Nucleic Acids. Structure and metabolism of nucleic acids in the context of their biological function in information transfer. Prerequisites: introductory biochemistry, Molecular Biology I, or consent of instructor. (Also listed as Biochemistry 268, Botany 268, and Microbiology and Immunology 268.) 3 units. *Modrich and staff*

269. Advanced Cell Biology. Structural and functional organization of cells and their components with emphasis on current research problems and prospects. Prerequisite: introductory cell biology or consent of designated instructor. (Also listed as Anatomy 269, Botany 269, Microbiology and Immunology 269, and Zoology 269.) 3 units. *Nicklas and staff*

Chemistry

Professor Lochmüller, *Chairman* (101 Gross Chemical Laboratory); Professor Wells, *Director of Graduate Studies* (329 Gross Chemical Laboratory); Professors Arnett, Chesnut, Jeffs, Krigbaum, McPhail, Palmer, Poirier, Porter, Quin, Smith, Strobel,

and Wilder; Associate Professors Baldwin, Crumbliss, Henkens, and Shaw; Assistant Professors Anderson and Sternbach; Adjunct Professors Ghirardelli, Pitt, and Spielvogel; Adjunct Assistant Professors Gangwal and Switzer

In the Department of Chemistry graduate work is offered leading to the M.S. and Ph.D. degrees. Before undertaking a graduate program in chemistry, a student should have taken an undergraduate major in chemistry, along with related work in mathematics and physics.

Graduate courses in the department are offered in the fields of analytical, inorganic, organic, and physical chemistry. Research programs are active in all these fields.

A booklet providing detailed information on the department is available from the Director of Graduate Studies.

For Seniors and Graduates

201. Molecular Spectroscopy. Selected spectroscopic methods in the study of molecular structure. Symmetry and group theoretical basis for selection rules, theories of magnetic and optical resonance, and interpretation of spectra; examples from both inorganic and organic chemistry. Three lectures. Prerequisite: consent of department. 1 to 3 units. *Staff*

203. Quantum Chemistry. Basic principles of quantum and group theoretical methods. Topics include symmetry, a review of the fundamentals, and the mathematical foundations of quantum theory. Emphasis on the application of molecular orbital theory to organic and inorganic systems. Prerequisite: Chemistry 162. 1 to 3 units. *Chesnut*

205. Structure and Reaction Dynamics. Structure and mechanisms in organic and inorganic compounds, substitution reactions, linear free energy relations, and molecular rearrangements. Emphasis on the use of kinetic techniques to solve problems in reaction mechanisms. Three lectures. Prerequisite: consent of department. 1 to 3 units. *Staff*

207. Principles of Kinetics, Thermodynamics, and Diffraction. Three lectures. Prerequisite: consent of instructor. 1 to 3 units. *Staff*

275, 276. Advanced Studies. (1) Analytical chemistry, (2) inorganic chemistry, (3) organic chemistry, and (4) physical chemistry. Open to especially well-prepared undergraduates by consent of department. 6 units. *Staff*

For Graduates

300. Basic Statistical Mechanics. Fundamentals of quantum and classical statistical mechanics using the ensemble approach. Emphasis on systems of weakly interacting particles with internal degrees of freedom. 3 units. *Staff*

302. Basic Quantum Mechanics. The fundamentals of quantum mechanics with special emphasis on chemical applications. Topics included are: linear algebra, the uncertainty relations, angular momentum, perturbation theory and time dependent phenomena, molecules in electromagnetic fields, group methods, and electron correlation. 3 units. *Staff*

303, 304. Special Topics in Physical Chemistry. Presentation of one or more topics of staff interest such as advanced methods in crystallography, light scattering and small angle X-ray diffraction, application of ESR spectroscopy to chemical problems, electronic spectroscopy of proteins, group theory, intermolecular forces, liquid crystals, methods of determining the rates of elementary steps in reaction kinetics, physical chemistry of aerosols, physical-chemical methods of polymer characterization, structure and bonding in metallo-enzymes, statistical

mechanics of fluids, topics in structural chemistry, and triplet excitons. 1 to 3 units each. *Staff*

310. Theoretical and Structural Inorganic Chemistry. An advanced study of theoretical concepts and structural determination techniques as applied to inorganic systems. Areas included are crystal field and ligand field theories; magnetic susceptibility; and electronic, infrared, and Raman spectroscopy. 3 units. *Crumbliss and Palmer*

312. Inorganic Reactions and Mechanisms. Chemistry of main group and transition elements. Emphasis on current developments in synthetic and mechanistic studies of inorganic, organometallic, and organometalloid compounds. 3 units. *Crumbliss and Wells*

313. Special Topics in Inorganic Chemistry. Lectures, oral reports, and discussions on advanced topics and recent advances in the field of inorganic chemistry. Examples of topics which may be discussed are bioinorganic chemistry, fluxional molecules, homogeneous catalysis, synthesis and properties of selected groups of compounds, and new physical methods. 1 to 3 units each. *Staff*

320. Synthetic Organic Chemistry. A study of the scope and limitations of the more important types of reactions in synthetic organic chemistry. Some discussion of the rapidly developing use of transition metals, complex hydrides, and photochemistry will be included. 3 units. *Baldwin or Sternbach*

322. Organic Reactive Intermediates. A discussion of reactive intermediates in organic chemistry. Topics will include carbanions, carbenes, carbonium ions, free radicals, photochemical excited states, and other reactive species. 3 units. *Porter, Wilder, and Arnett*

324. Special Topics in Organic Chemistry. Advanced topics and recent developments in the field of organic chemistry. Each year heterocyclic chemistry or the chemistry of natural products will be among the topics presented. Lectures and written and oral reports. 1 to 3 units each. *Staff*

330. Separation Science and Fundamental Electrochemistry. Section .01, fundamental separation chemistry; section .02, practical aspects of chromatographic separation methods; section .03, fundamentals of electrochemistry. 1 to 3 units. *Staff*

331, 332. Special Topics in Analytical Chemistry. An advanced treatment of important areas in modern analysis. Possible topics include: electrochemistry, small computer applications, magnetic resonance, and problem-solving approaches. 1 to 3 units each. *Staff*

334. Chemical Instrumentation and Practical Electrochemistry. Section .01, basic chemical instrumentation; section .02, optical chemical instrumentation; section .03, practical electrochemistry. 1 to 3 units. *Staff*

373, 374. Seminar. One unit is required of all Ph.D. candidates in chemistry. One hour a week discussion. 1 unit each. *All members of the graduate staff*

375, 376. Research. The aim of this course is to give instruction in methods used in the investigation of original problems. Individual work and conferences. 1 to 6 units each. *All members of the graduate staff*

377. Research Orientation Seminar. A survey of departmental research. Required of all entering graduate students in chemistry. Prerequisite: consent of Director of Graduate Studies. 1 unit. *All members of the graduate staff*

Classical Studies

Professor Newton, *Chairman* (325 Carr); Professor Richardson, *Director of Graduate Studies* (320 Carr); Professors Oates and Willis; Associate Professors Burian, Rigsby, Stanley, and Younger; Assistant Professor Boatwright

The Department of Classical Studies offers two programs leading to the Ph.D. degree, one with emphasis on literature and philology, the other with emphasis on ancient history and archaeology. For regular admission to the program in literature and philology, a student must offer three years of college study above the elementary level in one of the classical languages and two college years in the other. Students wishing to enter the program in ancient history and archaeology will be required on entrance to demonstrate satisfactory competence in both Greek and Latin for reading in the primary sources; failure to demonstrate such competence will require modification of the student's program to repair the deficiency.

The department's special requirements, in addition to the general requirements of the University for the Ph.D. degree set forth in the section on program information of this bulletin, are presented in a sheet that may be obtained from the Director of Graduate Studies. They include special requirements in course work and the preliminary examination for the Ph.D. degree.

A reading knowledge of German and French is required of all candidates for the Ph.D. degree. The candidate should meet one of the language requirements by the end of the first term in residence and the other by the end of the third term.

GREEK

For Seniors and Graduates

200. Graduate Reading. 3 units. *Staff*

203. Homer. Problems of language and structure in the *Iliad*; present state of Homeric scholarship. 3 units. *Stanley*

205. Greek Lyric Poets. Fragments of the early lyric poets; selected odes of Pindar and Bacchylides. 3 units. *Burian*

206. Aeschylus. The *Oresteia*, with study of the form of *Agamemnon* and its place in the design of the trilogy. 3 units. *Willis*

210. Aristophanes. Origin and development of Greek comedy; representative plays. 3 units. *Burian*

226. Orators. Selections from the principal Attic orators, with emphasis on Lysias and Demosthenes. 3 units. *Willis*

For Graduates

At least two of these are offered each year.

301. Greek Seminar I. 3 units. *Staff*

304. Greek Seminar IV. 3 units. *Staff*

321. Seminar in Literary Papyri. 3 units. *Willis*

399. Directed Reading and Research. Credit to be arranged. *Staff*

Courses Currently Unscheduled

209. Euripides

221. Early Greek Prose

- 222. Thucydides
- 231. Hellenistic Poetry
- 302. Greek Seminar II
- 303. Greek Seminar III
- 313. Proseminar in Greek Epigraphy

LATIN

For Seniors and Graduates

- 200. Graduate Reading. 3 units. *Stanley or Younger*
- 203. Epic: Vergil. The *Aeneid*. 3 units. *Newton*
- 210. Lyric and Occasional Poetry. Emphasis upon Catullus and Horace; additional readings and reports on the *Appendix Vergiliana*, Statius, and Martial. 3 units. *Staff*
- 211. Elegiac Poets. The traditions of Roman love elegy and its development in Propertius, Tibullus, and Ovid. 3 units. *Richardson*
- 221. Medieval Latin. Selected works of the Latin Middle Ages from Prudentius to the humanists; genres studied usually include the hymn, sequence, drama, lyric, saints' lives, chronicle, epic, and epistle. (Also listed under Medieval and Renaissance Studies.) 3 units. *Newton*

For Graduates

At least two of these are offered each year.

- 301. Latin Seminar I. 3 units. *Staff*
- 302. Latin Seminar II. 3 units. *Staff*
- 303. Latin Seminar III. 3 units. *Staff*
- 304. Latin Seminar IV. 3 units. *Staff*
- 312. Proseminar in Latin Paleography. (Also listed under Medieval and Renaissance Studies.) 3 units. *Newton*
- 399. Directed Reading and Research. Credit to be arranged. *Newton*

Courses Currently Unscheduled

- 201. The Verse Treatise
- 204. Epic
- 306. Latin Seminar VI
- 314. Proseminar in Latin Epigraphy
- 315. Proseminar in Roman Law

CLASSICAL STUDIES

For Graduates

- 301. Introduction to Classical Philology I. Introduction to the bibliography and principal disciplines of the field. 3 units. *Staff*

Courses Currently Unscheduled

- 302. Introduction to Classical Philology II
- 351. The Teaching of Classics

CLASSICAL STUDIES (ANCIENT HISTORY)

For Seniors and Graduates

- 255. *The Age of Pericles*. 3 units. *Oates*
- 261. *The Roman Revolution, 146-30 B.C.* 3 units. *Oates*

For Graduates

At least two of these are offered each year.

- 321. *Seminar in Ancient History I*. 3 units. *Staff*
- 399. *Directed Reading and Research*. Credit to be arranged. *Staff*

Courses Currently Unscheduled

- 258. *Social and Cultural History of the Graeco-Roman World*
- 322. *Seminar in Ancient History II*
- 323. *Seminar in Ancient History III*
- 324. *Seminar in Ancient History IV*
- 327. *Seminar in Byzantine History*

CLASSICAL STUDIES (ARCHAEOLOGY)

For Seniors and Graduates

- 232S. *Greek Painting*. (Also listed as Art 220S.) 3 units. *Bruzelius or Stanley*
- 233. *Greek Architecture*. Development of form and function in the various religious, civic, and domestic building types, from the Bronze Age through the Hellenistic period. 3 units. *Richardson*
- 234. *Roman Sculpture*. The evolution of religious, commemorative, and decorative relief, and portrait and monumental sculpture. From Italic origins to the later Empire. 3 units. *Younger*
- 235S. *Roman Architecture*. Significant monuments chosen to exemplify the Roman genius in building in the late Republic and early Empire. 3 units. *Richardson*
- 236S. *Roman Painting*. Roman pictorial art with concentration on the wall paintings from Campania. Investigation of techniques, iconography, and the use of pictures in decoration. 3 units. *Richardson*

Courses Currently Unscheduled

- 231S. *Greek Sculpture*
- 311. *Archaeology Seminar I*
- 312. *Archaeology Seminar II*

Under the terms of a cooperative agreement, graduate students of Duke University may take any graduate course offered by the Department of Classics of the University of North Carolina. A list of these courses will be sent upon request.

Computer Science

Professor Gallie, *Acting Chairman* (203 North); Professor Rosenberg, *Director of Graduate Studies* (205 North); Professors Loveland, Marinos, Patrick, Starmer, Utku,

and Woodbury; Associate Professors Biermann, Trivedi, and Wagner; Assistant Professors Ballard, Bowyer, Geist, and Smith; Associate Research Professors Kootsey and Ramm; Adjunct Research Associate Professor Weste

The Department of Computer Science offers programs leading to the A.M. and Ph.D. degrees. The Ph.D. program is a joint offering with the computer science department of the University of North Carolina at Chapel Hill.

A student entering graduate work in computer science should have a knowledge of mathematics through advanced calculus, of data structures, and of assembler as well as higher level computer programming languages. Research interests of present faculty include mathematical foundations of computer science, artificial intelligence, analysis of algorithms, programming methodology, real-time computing, operating data base systems, computer systems design and analysis, parallel processing systems, numerical analysis, and very large-scale integration.

For Seniors and Graduates

200. Programming Methodology I. Practical and theoretical topics including structured programming, specification and documentation of programs, debugging and testing strategies, choice and effective use of programming languages and systems, psychology of computer programming, proof of correctness of programs, analysis of algorithms, and properties of program schemata. Prerequisite: Computer Science 152. 3 units. *Wagner*

201. Programming Languages. Information binding, data structures and storage, control structures, recursion, execution environments, input/output; syntax and semantics of languages; study of PL/I, Fortran, Algol, APL, LISP, SNOBOL, and SIMULA; exercises in programming. Prerequisite: Computer Science 200. 3 units. *Ballard or taught at UNC-CH as Comp 244*

204. Computer Network Architecture. The architecture of computer communication networks and the hardware and software required to implement the protocols that define the architecture. Basic communication theory, transmission technology, private and common carrier facilities. Addressing structures and error recovery. Multivendor software compatibility. Economic trade-offs. International standards. Prerequisites: Computer Science 154 and Electrical Engineering 157. (Also listed as Electrical Engineering 204.) 3 units. *Pitt*

207. Fault-Tolerant Computer Systems. (Also listed as Electrical Engineering 207.) 3 units. *Marinos*

208. Digital Computer Design. (Also listed as Electrical Engineering 208.) 3 units. *Marinos*

209. Microprocessor Fundamentals and Applications. (Also listed as Electrical Engineering 209.) 4 units. *Marinos*

210. VLSI Systems: an Introduction. A first course in VLSI using the Mead-Conway approach. Topics include (1) the basic components of MOS technology: the transistor and gates constructed therefrom; (2) techniques for composing components into useful logic blocks: array logic, passive logic networks, sequential machines; (3) introduction to techniques for composing logic blocks into systems; and (4) introduction to software systems that aid the design process. Students will complete the design of a small system in NMOS. Prerequisite: Computer Science 157 or equivalent. 3 units. *Staff or taught at UNC-CH as Comp 268*

215. Artificial Intelligence. Heuristic versus algorithmic methods; programming of games such as chess; theorem proving and its relation to correctness of programs; readings in simulation of cognitive processes, problem solving, semantic memory, analogy, adaptive learning. Prerequisite: Computer Science 152 or consent of instructor. 3 units. *Ballard or Biermann*

220. VLSI Algorithmics. Algorithmic and systems aspects of VLSI. Topics may include theoretical studies of the layout problem, array logic, placement and routing, fault-tolerance in VLSI designs, design for testability, the design of networks of processors, and cost trade-offs in VLSI designs. Prerequisites: Computer Science 210 and 224. 3 units. *Rosenberg*

221. Numerical Analysis I. Error analysis, interpolation and spline approximation, numerical differentiation and integration, solutions of linear systems, nonlinear equations, and ordinary differential equations. Prerequisites: knowledge of an algorithmic programming language and intermediate calculus. (Also listed as Mathematics 221.) 3 units. *Gallie or Patrick*

222. Numerical Analysis II. Calculation of eigenvalues and eigenvectors, numerical methods for solving partial differential equations, and integral equations. Prerequisite: Computer Science 221 or equivalent. (Also listed as Mathematics 222.) 3 units. *Patrick or Ulku*

224. Analysis of Algorithms. Design and analysis of efficient algorithms. Design techniques include recursion, divide-and-conquer, and dynamic programming. Applications include sorting, searching, dynamic structures, path-finding, fast multiplication, fast Fourier transform. Nondeterministic algorithms. Computationally hard problems. NP-completeness. This course is the same as Computer Science 124 with more advanced level work required of the student. Prerequisites: Computer Science 152 and four semesters of college mathematics. 3 units. *Loveland or Rosenberg*

225. Formal Languages and Theory of Computation. An introduction to the study of abstract machines and the languages they define, their capabilities and limitations. Finite-state automata, regular languages, pushdown automata, context-free languages, Turing machines, recursive functions and recursively enumerable sets, noncomputable sets, measures of complexity for algorithms. Prerequisites: four semesters of undergraduate mathematics. 3 units. *Loveland or Rosenberg*

226. Mathematical Methods for Systems Analysis I. Basic concepts and techniques used in the stochastic modeling of systems. Elements of probability, statistics, queuing theory, and simulation. Prerequisites: four semesters of college mathematics. 3 units. *Trivedi or Geist*

227. Mathematical Methods for Systems Analysis II. Basic concepts and techniques used in the deterministic modeling of systems. Elements of linear algebra; linear, integer, dynamic, and geometric programming; and unconstrained and constrained optimization. Prerequisites: four semesters of college mathematics. 3 units. *Geist*

231. Introduction to Operating Systems. Basic concepts and principles of multiprogrammed operating systems. Memory, CPU, I/O device management, and scheduling. Buffering techniques. Performance evaluation. Case studies of existing systems. Prerequisite: Computer Science 154. 3 units. *Geist, Smith, Trivedi, or taught at UNC-CH as Comp 242*

232. Compiler Construction. Models and techniques used in the design and implementation of assemblers, interpreters, and compilers. Lexical analysis, compilation of arithmetic expressions and simple statements, specifications of syntax, algorithms for syntactic analysis, code generation, and optimization techniques. 3 units. *Wagner*

241. Data Base Methodology. Basic concepts and principles. Relational, hierarchical, and network approaches to data organization; data entry and query language support for data base systems; theories of data organization; security and privacy issues. Prerequisites: Computer Science 154 and either 155 or 163. 3 units. *Starmer*

252. Computer Systems Organization. Hardware and software aspects. Processor, memory, device, and communication subsystems; case studies of hardware system organization, e.g., parallel, associative, fault-tolerant; organization of software systems to exploit hardware systems organization; economic and reliability aspects of various hardware organizations. Prerequisites: Computer Science 154 and 157. (Also listed as Electrical Engineering 252.) 3 units. *Trivedi*

265. Advanced Topics in Computer Science. 3 units. *Staff*

For Graduates

308. Advanced Topics in Digital Systems. (Also listed as Electrical Engineering 308.) 3 units. *Marinos*

310. CMOS VLSI Design. A second course in VLSI, aimed at the design of VLSI systems in CMOS. The main thrusts of the course will be (1) to provide enough background in the theory of CMOS circuits to understand circuit level trade-offs; (2) to introduce a symbolic design system and its supporting software, which greatly aid the design process; (3) to examine sample chip designs with an eye to understanding competitive design methodologies. Students will complete a CMOS-oriented project comprising the design and implementation of either a hardware or a software subsystem. Prerequisite: Computer Science 210 or equivalent. 3 units. *Staff*

315. Advanced Artificial Intelligence. Course content will vary from year to year and will include a detailed study of one or more of the following: mechanical theorem proving, natural language processing, automatic program synthesis, machine learning and inference, representations of knowledge, languages for artificial intelligence research, artificial sensorimotor systems, and others. Prerequisite: Computer Science 215. 3 units. *Biermann*

326. Systems Modeling. Advanced study of analytical models of systems; queuing model and its parameterization and validation. Methods for computer solutions of some models. Prerequisites: Computer Science 226 and 231. 3 units. *Trivedi*

331. Operating Systems Theory. Advanced study of theoretical aspects of operating systems emphasizing models and control of concurrent processes, processor scheduling, and memory management. Prerequisites: Computer Science 226 and 231. 3 units. *Trivedi or Wagner*

COURSES CURRENTLY UNSCHEDULED

301. Topics in Programming Theory

321. Topics in Numerical Mathematics

325. Theory of Computation

332. Topics in Operating Systems

SUPPLEMENTARY COURSES OFFERED AT UNC-CH

Comp 114. Systematic Programming

Comp 145. Software Engineering Laboratory

Comp 171. Natural Language Processing

Comp 230. File Management Systems

Comp 236. Computer Graphics

Comp 254. Picture Processing and Pattern Recognition

Economics

Professor Wallace, *Chairman* (215A Social Science); Professor Weintraub, *Director of Graduate Studies* (227 Social Science); Professors Bronfenbrenner, Davies, Goodwin, Grabowski, Graham, Havrilesky, Kelley, Lewis, Naylor, Tower, Treml, Vernon, and Yohe; Associate Professors Clotfelter, Cook, Fenoaltea, and McElroy; Assistant Professors Conrad, Kimbrough, Luger, Nickerson, and Tauchen

The Department of Economics offers graduate work leading to the A.M. and Ph.D. degrees. Among the undergraduate courses of distinct advantage to the graduate student in economics are statistics, economic theory, and basic courses in philosophy, mathematics, and social sciences other than economics. Advanced work in mathematics or statistics is also useful.

Requirements for the Ph.D. degree in economics include courses in economic theory, quantitative methods, and econometrics in the first year, and at the end of the second year, an examination in economic analysis. In addition, a student must obtain certification in three fields, one of which may be in an outside minor. The student may select from advanced economic theory, history of political economy, economic development, economic history, international economics, money and banking, labor economics, public finance, industrial organization, econometrics, statistics, Soviet economics, corporate economics, and certain fields outside the economics department (e.g., demography). Course work for the Ph.D. degree should be completed in five semesters of residence.

For Seniors and Graduates

200. Capitalism and Socialism. Selected ideological classics of new and old, right and left economics including both "counsels for perfection" (utopias) and "precepts for action" in political economy. Prerequisites: Economics 149 and 154 or consent of instructor. 3 units. *Bronfenbrenner*

204S. Advanced Monetary Economics. Monetary theory and its statistical and institutional implementation. Particular attention to the development of aggregative theories of prices, interest rates, and production; the functioning of monetary policy within various theoretical frameworks; appraisal of recent use and limitations of Federal Reserve policy. Prerequisite: Economics 153. 3 units. *Havrilesky or Yohe*

205S. Advanced Monetary Theory and Policy. Emphasis on recent issues: innovations in the payments mechanism and new monetary aggregates, the subterranean economy, financial crises, alternative views of the monetary policy transmission mechanism, and the monetarist-fiscalist controversy. Prerequisite: Economics 153. 3 units. *Havrilesky or Yohe*

212S. Economic Science and Economic Policy. A historical examination of the impact of economics on public policy; special attention to agriculture, labor relations, the Council of Economic Advisers, and the experience of other countries. 3 units. *Goodwin*

219. Economic Problems of Underdeveloped Areas. Analysis of underdeveloped countries with some attention to national and international programs designed to accelerate development. Prerequisite: Economics 149 or 154 or consent of instructor. 3 units. *Kelley*

232S. Economic History of Japan. Japanese economic development, stressing the period since the end of isolation. Prerequisite: one course in economic analysis or in Far Eastern history. (Also listed as History 260S.) 3 units. *Bronfenbrenner*

233. State and Urban Finance.* Expenditures, taxation, and financial administration in state and local governments, with emphasis on current problems. Special attention will be given to research methods and materials, and to the financial relations between state and local governments. 3 units. *Davies or Luger*

234. Urban and Regional Economics. Presents models: to analyze metropolitan systems and the location of economic activity; to understand the causes of selected urban and regional problems, including unbalanced growth and development, poor housing conditions, residential segregation, deteriorating services, and fiscal crises; and to assess the impact of public policies toward states and substate areas. Prerequisite: Economics 149 or consent of instructor. 3 units. *Clotfelter or Luger*

235. The Economics of Crime, Law Enforcement, and Justice. An analysis of the social costs of law enforcement and crime, a theoretical and empirical study of criminal deterrence, the measurement and production of law enforcement outputs, and an economic analysis of the courts and correctional system. Prerequisite: Economics 149 or equivalent. 3 units. *Cook*

237. Statistical Methods. A study of statistical methods appropriate for dealing with problems in business and social science. In addition to developing more thoroughly the subject considered in business statistics, the following methods will be considered: simple, multiple, partial, and curvilinear correlation; curve fitting; probability; sampling distributions; and statistical inference. Prerequisite: Economics 138 or consent of instructor. 3 units. *McElroy*

243. Econometrics I. Economic theory, mathematics, statistical inference, and electronic computers applied to analysis of economic phenomena. Objective is to give empirical content to economic theory. Matrix algebra used to develop topics in inference, linear regression, and systems of simultaneous equations. Use is made of the electronic computer. Prerequisites: Economics 149 and 237 or equivalents. 3 units. *Wallace*

244. Corporate Economics I. Strategic planning models of the firm including marginal analysis, mathematical programming, portfolio, and corporate simulation models. Economics as the language of corporate planning and modeling. Prerequisites: Economics 138 and 149 or equivalents. 3 units. *Naylor*

245. Econometrics II. Advanced theory and applications: includes specification error, generalized least squares, lag structures, Bayesian decision making, simultaneous equation methods, and forecasting. Emphasis on current applied literature. Prerequisite: Economics 243. 3 units. *McElroy or Wallace*

246. Selected Topics in Econometric Theory. Analysis of panel data, combining data from different sources, vector autoregressive methods, problems of causation in time series data, nonlinear estimation, limited dependent variables, sample selection bias, and other topics to be chosen subject to the interests of the class. 3 units. *Tauchen or Wallace*

250. Modern Economic Thought. Integrated survey of the several major streams of economic theory since 1936. Selected topics from the economics of Keynes, its offshoots and coordinate developments, and post-Marxian economic theory. Historical evolution of recent ideas and their interrelations. Prerequisite: Economics 154. 3 units. *Weintraub*

265S. International Trade and Finance. Fundamental principles of international economic relations. The economic basis for international specialization and trade and the economic gains from trade, the balance of international payments, problems of international finance, investments, and monetary problems. Prerequisites: Economics 149 and 154. 3 units. *Bronfenbrenner, Kimbrough, or Tower*

*Offered on demand.

282S. Canada. See course description for History 282S. (Also listed as Anthropology 282S, Political Science 282S, and Sociology 282S.) 3 units. *Leach and visitors*

285. Evaluation of Public Expenditures. Introduction to cost-benefit analysis applied to public sector spending. Optimal investment decisions; shadow pricing of capital labor and foreign exchange; risk and uncertainty; and the impact of government expenditures on the distribution of income. Prerequisite: Economics 149. 3 units. *R. Conrad and Kimbrough*

287. Public Finance. Economic aspects of such problems as the growth of government, the proper role of the state, the centralization and decentralization of government, government bureaucracy, the impact of taxes and spending on the wealthy and the poor, as well as other public policies and questions. 3 units. *Davies*

293. Soviet Economic History. Establishment of foundations of a socialist economy: collectivization, industrialization, and search for economic efficiency. 3 units. *Trembl*

294S. Soviet Economic System. Economic planning and administration in the Soviet Union and other socialist countries. International comparisons. Theoretical and applied problems of resource allocation, economic development, and optimal micro-decision making in a nonmarket economy. 3 units. *Trembl*

For Graduates

301. Microeconomic Analysis I. Review of contemporary theory relating to production, the firm, and income distribution in competitive and imperfectly competitive markets. 3 units. *Graham*

302. Microeconomic Analysis II. A continuation of Economics 301 with emphasis on analyses of consumer behavior, general equilibrium, welfare economics, and capital theory. Prerequisite: Economics 301. 3 units. *Staff*

304, 305. Monetary Theory and Policy. 304: theories of the supply of and demand for money (neoclassical and Keynesian macroeconomic), general equilibrium theories, and theories of the term structure of interest rates. 305: the theory and practice of monetary policy with emphasis on recent issues, the monetarist-fiscalist controversy, the monetary policy transmission mechanism, and policy simulations with econometric models. 3 units each. *Havrilesky or Yohe*

307. Quantitative Analysis I. A systematic analysis of the principal quantitative methods used in microeconomic theory. Neoclassical theories of production and distribution are used as vehicles for presenting the material. Considerable emphasis is placed on the application of mathematical analysis to economic models. 3 units. *Weintraub*

308. Quantitative Analysis II. Dynamic optimization techniques, including the calculus of variations and optimal control, are analyzed and applied to problems involving capital accumulation, resource extraction, and aspects of firm behavior. 3 units. *Graham or Nickerson*

311, 312. History of Political Economy. A detailed review of the development of economic theory, the tools of economic analysis, and economics as a science, together with an analysis of the circumstances affecting this development. Period covered: pre-Christian times through 1936. 3 units each. *Goodwin*

313, 314. Seminar in Economic Theory. Prerequisite: Economics 301 or equivalent. 3 units each. *Weintraub*

316. Seminar in Economics of Soviet-Type Socialism. Selected topics in analysis of theoretical and institutional framework of Soviet economic system,

such as markets versus plan, optimizing techniques in planning, price determination, balanced economic development, and ideology and economic policy. 3 units. Trembl

317. Seminar in Demographic, Population, and Resource Problems (Development Economics I). Historical, empirical, and theoretical topics in development economics focusing on real aspects of growth in a closed economy. Special attention to human resource economics (demography, education, nutrition), models of dualism, agricultural growth, and technology. 3 units. Kelley

319. Seminar in the Theory and the Problems of Economic Growth and Change (Development Economics II). Links between aid, financial markets, and real investment in an open economy stressing tariff protection and capital controls (internal and external). Economic policymaking using market solutions and/or planning models (input-output, linear programming, and computable general equilibrium). 3 units. Brock

320. Macroeconomic Analysis I. Measurement of national income and other important aggregates; classical macroeconomics; Keynesian and more recent views of the determinants of income, employment, and price levels; empirical studies of consumption, investment, and monetary variables. 3 units. Bronfenbrenner

322. Macroeconomic Analysis II. Further analysis of topics treated in Economics 320. Optimal economic growth; business cycles. Issues in economic policy. Prerequisite: Economics 320. 3 units. Tauchen

329. Federal Finance. An analysis of the trends and hypotheses concerning the growth in governmental activity, the optimum level and composition of governmental spending, and the microeconomic and macroeconomic effects of governmental spending and tax policies. 3 units. Clotfelter, R. Conrad, or Davies

330. Seminar in Public Finance. 3 units. Staff

355. Seminar in Labor Economics. 3 units. Lewis

358. Seminar in Labor Market and Related Analysis. 3 units. Lewis

365. Seminar in International Trade Theory and Policy. 3 units. Tower

366. Seminar in International Monetary Theory. 3 units. Staff

388. Industrial Organization.* The theory, measurement, and history of the firm-structure of industry. Emphasis upon the structure of American industry and upon actual production and pricing practices. Criteria for evaluating industrial performance. 3 units. Vernon or Grabowski

389. Seminar in Industrial and Governmental Problems.* 3 units. Vernon

397, 398. Directed Research. 3 units. Staff

COURSES CURRENTLY UNSCHEDULED

231S. Analytical Economic History

247. Corporate Economics II

303. Theory of Economic Decision Making

318. Dissertation Seminar

321. Theory of Quantitative Economic Policy

323. Income Distribution Theory

331. Seminar in Economic History

*Offered on demand.

345, 346. Demographic Techniques I and II

350. Seminar in Applied Economics

401. Seminar on the British Commonwealth

402. Interdisciplinary Seminar in the History of the Social Sciences

Related Courses in Other Departments

Courses in related fields may be selected from anthropology, computer science, forestry, history, mathematics, philosophy, political science, public policy sciences, and sociology, or from an area that complements the candidate's area of research interests in economics.

See Program in Comparative Studies on Southern Asia and the Center for Demographic Studies in the chapter "Special and Cooperative Programs" for further information.

Education

Associate Professor Davis, *Chairman* (213 West Duke); Associate Professor Carbone, *Director of Graduate Studies* (213 West Duke); Professors Gehman and Page; Associate Professors Ballantyne, Di Bona, Johnson, Martin, and Sawyer; Assistant Professors Mayesky and Michlin; Adjunct Professor Pittillo; Lecturers Fowler and Leach

For students admitted to graduate programs prior to fall 1981, specific requirements may be obtained in the Graduate School office. Qualified juniors, seniors, and graduate students may enroll in appropriate education courses as electives.

For Seniors and Graduates

205. **Selected Topics.** 3 units. *Staff*

211. **Education and the Mass Media.** Impact of mass media on behavior, particularly of children. 3 units. *Di Bona*

213. **Elementary School Organization and Administration.** Nursery school, kindergarten, and the elementary school. Problems of internal organization and management of elementary school and its integration with secondary school. 3 units. *Pittillo*

215S. **Secondary Education: Principles.** Principles, curriculum, and methods in secondary education. Prerequisite: C average overall and in teaching field or fields. Must be accompanied by Education 216. 3 units. *Carbone, Michlin, and staff*

216. **Secondary Education: Internship.** Supervised internship in junior and senior high schools. Full time for half a semester. 6 units. *Carbone, Michlin, and staff*

225. **The Teaching of History and the Social Studies.** Evaluation of the objectives, content, materials, and methods in the teaching of history and the social studies. 3 units. *Carbone and staff*

227. **Contemporary Theories of Counseling and Psychotherapy.** Prerequisites: two courses in psychology or educational psychology. 3 units. *Gehman*

232. **Psychoeducational Counseling with Families.** Individual and group counseling concerning psychoeducational problems of families. Prerequisite: consent of instructor. 3 units. *Ballantyne and Davis*

236. **Teaching Developmental and Remedial Reading in the Secondary School.** Principles, methods, and materials for the development of effective

reading attitudes and skills in developmental and remedial programs. 3 units. *Michlin*

237. Teaching of Literature in Secondary Schools. Conventional, adult, and transitional literature are considered. 3 units. *Michlin*

239. Teaching of Grammar, Composition, Mechanics, and Usage in Secondary School. Recent developments. 3 units. *Michlin*

242. Group Counseling. Theories and techniques of counseling for small groups of children, adolescents, teachers, parents, and other adults. Prerequisite: consent of instructor. 3 units. *Ballantyne or Gehman*

246. Teaching of Mathematics. Aims, curriculum, and classroom procedure for teaching secondary school mathematics. 3 units. *Staff*

255. Tests and Measurements. Measurement of abilities, personality, and achievement. Tests and other instruments for evaluating individual and program performance. 3 units. *Page*

276. Teaching of High School Science. Discussion, lectures, and collateral reading related to such topics as aims, tests, curriculum, classroom and laboratory procedure, field trips, and course and lesson planning for secondary school science. 3 units. *Staff*

For Graduates

304. Internship in School Psychology. Supervised internship in school psychology, utilizing principles and practices in an approved internship site. Prerequisite: consent of instructor. 3 units. (May be repeated.) *Davis*

335, 336. Seminar in School Administration. Organization and control over public education. 335: attention to governance of education as exercised by the different branches and levels of government. 336: administrative organization. 3 units each. *Pittillo*

350, 351. Directed Activities in Education. Internship experiences at an advanced level under supervision of appropriate staff. Prerequisite: consent of instructor. 3 units each. *Staff*

357. Directed Research. For students who have passed the preliminary examination. 1 to 6 units. *Staff*

COURSES CURRENTLY UNSCHEDULED

203. Seminar in Philosophical Analysis of Educational Concepts

206. Studies in the History of Educational Philosophy

217. The Psychological Principles of Education

226. Teaching Developmental and Remedial Reading in the Elementary School

230. Research Methods in Education

234. Secondary School Organization and Administration

241. Counseling Psychology

248. Practicum in Counseling

258. Assessment of Personality, Interests, and Attitudes

260. Educational Research I

261. Educational Research II

262. Educational Research III

270. Junior and Community College

271. Instructional Systems for College and University Teaching

277. Student Personnel Services in Higher Education

Engineering

George W. Pearsall, Sc. D., *Acting Dean* (136 Engineering)

The School of Engineering offers programs of study and research leading to the M.S. and Ph.D. degrees with a major in biomedical, civil and environmental, or electrical engineering, or in mechanical engineering and materials science. These programs are designed to provide a fundamental understanding of the engineering sciences, which are based on mathematics and the physical sciences, and to develop experience in the art of engineering, which includes strong elements of intuition, imagination, and judgment. Engineering graduate students may participate in seminars appropriate to their fields of study.

A *minimum* of 30 units of earned graduate credit beyond the bachelor's degree is required for the M.S. degree: 12 in the major, 6 in related minor work (usually mathematics or natural science), 6 in either the major or minor subject or in other areas approved by the major department, and 6 for a research-based thesis. A nonthesis option requiring 30 units of course credit is available. Each of the departments imposes additional requirements in the exercise of this option. There is no language requirement for this degree.

A *minimum* of 60 units of earned graduate credit beyond the bachelor's degree is required for the Ph.D. degree. In civil and electrical engineering, 24 units are required in the major field and 12 units in a related minor field (often mathematics or natural science), 12 in either the major or minor subject or other areas approved by the major department, and 12 for a research-based dissertation. In biomedical and mechanical engineering there are no specific course requirements; each program is planned to meet individual needs. Doctoral students are required to pass qualifying and preliminary examinations which may be either written, oral, or a combination of written and oral components, at the discretion of the committee and the department.

BIOMEDICAL ENGINEERING

Professor Clark, *Chairman* (263 Engineering Annex); Professor Barr, *Director of Graduate Studies* (266 Engineering Annex); Professors Hammond, Hochmuth, McElhaney, Nolte, Pilkington, Thurstone, and Wolbarsht; Associate Professors Burdick and von Ramm

Biomedical engineering is often defined as the application of the concepts and methods of the physical, mathematical, and engineering sciences to biology and medicine. Specific research topics range from formalized mathematical theory through experimental science to practical clinical applications. The purpose of the graduate program in biomedical engineering is to encourage combining engineering and biomedical course work with an interdisciplinary research topic so that the graduates of this program can contribute at the most advanced professional level. The major research areas available include: biomechanics, biomedical materials, biomedical modeling, data acquisition and processing, and electrophysiology. Every biomedical engineering graduate student is required to serve as a teaching assistant for one to three semesters.

202. Biomedical Transfer Processes. An introduction to biomedical diffusion and momentum transfer with particular emphasis on physical models of biological and artificial organ systems. 3 units. *Clark and Hochmuth*

204. Measurement and Control of Cardiac Electrical Events. Design of biomedical devices for cardiac application based on a review of theoretical and experimental results from cardiac electrophysiology. Evaluation of the underlying cardiac events using computer simulations. Examination of electrodes, amplifiers, pacemakers, and related computer apparatus. Construction of selected examples. Prerequisites: Biomedical Engineering 101 and 163 or equivalents. 4 units. *Barr*

205, 206. Microprocessors and Digital Instruments. Design of microcomputer-based devices including both hardware and software considerations of system design. Primary emphasis on hardware aspects, including a progression through initial design, prototype construction in the laboratory, testing of prototypes to locate and correct faults, and final design evaluation. Evaluation includes examination of complexity, reliability, and cost. Design and construction oriented toward biomedical devices or instruments that include dedicated microcomputers, usually operating in real time. Prerequisites for 205: Engineering 51 and Biomedical Engineering 163, 164 or equivalents; for 206: satisfactory work in 205. 4 units each. *Barr, Hammond, and von Ramm*

215. Biomedical Materials and Artificial Organs. Chemical structures, processing methods, evaluation procedures, and regulations for materials used in biomedical applications. Applications will include implant materials, components of *ex vivo* circuits, and cosmetic prostheses. Primary emphasis will be placed on polymer-based materials and on optimization of parameters of materials which determine their utility in applications such as artificial kidney membranes and artificial arteries. Prerequisite: Engineering 83 or Chemistry 151 or consent of instructor. (Also listed as Mechanical Engineering 215.) 3 units. *Clark*

230. Biomechanics. Kinematic models of human motions, mechanical properties of bone and soft tissues, hydrodynamics of micturition, load directed growth mechanisms, human tolerance to impact and vibration, head injury criteria applied to helmet design. Prerequisite: consent of instructor. 3 units. *McElhaney*

243. Computers in Biomedical Engineering. An in-depth study of the use of computers in biomedical applications. Hardware, software, and applications programming will be considered. Data collection, analysis, and presentation will be studied within application areas such as monitoring, medical records, computer-aided diagnoses, computer-aided instruction, M.D.-assistance programs, laboratory processing, wave form analysis, hospital information systems, and medical information systems. 3 units. *Hammond*

265. Advanced Topics in Biomedical Engineering. Advanced subjects related to programs within biomedical engineering tailored to fit the requirements of a small group. Prerequisites: consent of Chairman and instructor. 1 to 4 units. *Staff*

For Graduates

333. Biomedical Imaging. A study of the fundamentals of information detection, processing, and presentation associated with imaging in biology and medicine. Analysis of coherent and incoherent radiation and various image generation techniques. Also covered will be the psychometrics of image evaluation dealing with subjective and objective parameters. Emphasis will be placed upon sonography, thermography, X-ray, various forms of nuclear radiography, microscopy, and holography. 3 units. *Thurstone*

399. Special Readings in Biomedical Engineering. Individual readings in advanced study and research areas of biomedical engineering. Prerequisite: approval of Director of Graduate Studies. 1 to 3 units each. *Staff*

Courses Currently Unscheduled

- 201. Analysis of Bioelectric Phenomena
- 207. Experimental Mechanics
- 221. Electrophysiological Techniques
- 311. Inverse Models

CIVIL AND ENVIRONMENTAL ENGINEERING

Professor Melosh, *Chairman* (121 Engineering); Associate Professor Petroski, *Director of Graduate Studies* (126 Engineering); Professors Muga, Utku, Vesilind, and J. F. Wilson; Associate Professors Biswas, Medina, and Peirce; Assistant Professors Marin, Pas, and Reckhow; Adjunct Professor Saibel

A student may specialize in one of the following fields of study for either the M.S. or the Ph.D. degree: environmental engineering; geotechnical engineering and soil mechanics; mechanics of solids; materials engineering; fluid mechanics, water resources, and ocean engineering; structural engineering; and urban systems and transportation. Interdisciplinary programs combining study in some of the major areas with biological sciences, business administration, materials science, social sciences, political science, public policy studies, and other areas of engineering are also available.

With the approval of the department, a master's degree candidate in civil engineering may choose, in lieu of submitting a thesis, to complete an additional 6 units of course work plus a special project. If this alternative is elected, candidates are expected to take comprehensive examinations over their graduate course work, and also to defend orally their special projects.

Under the Reciprocal Agreement with Neighboring Universities, a student may include as a portion of the minimum requirements work offered by the Department of Environmental Sciences and Engineering of the University of North Carolina. Although related work normally is taken in the natural sciences or mathematics, a student whose major interest relates to the social or managerial sciences may take relevant work in these areas.

201. Advanced Mechanics of Solids. Tensor fields and index notation. Analysis of states of stress and strain. Conservation laws and field equations. Constitutive equations for elastic, viscoelastic, and elastic-plastic solids. Formulation and solution of simple problems in elasticity, viscoelasticity, and plasticity. 3 units. *Petroski*

204. Plates and Shells. Differential equation and extremum formulations of linear equilibrium problems of Kirchhoffian and non-Kirchhoffian plates of isotropic and orthotropic material. Solution methods. Differential equation formulation of thin shell problems in curvilinear coordinates; membrane and bending theories; specialization for shallow shells, shells of revolution, and plates. Extremum formulation of shell problems. Solution methods. Prerequisites: Mathematics 111 and Engineering 75 or 135. 3 units. *Utku*

205. Elasticity. Introduction to linear theory of elasticity. Constitutive equations for anisotropic and isotropic elastic solids. Formulation and solution of torsion, bending, and plane problems by semi-inverse, complex potential, and variational methods. Three-dimensional problems. Prerequisite: Civil and Environmental Engineering 201 or equivalent. 3 units. *Petroski*

212. Mechanical Behavior of Materials. Historical perspective on structural failure. Fracture mechanics and its application to brittle and ductile fracture, and to fatigue in structural materials. Analysis of load spectra; fatigue crack growth calculations. 3 units. *Petroski*

215. Urban and Regional Systems Analysis. Identification, formulation, and solution of urban and regional systems problems. Models of population growth and distribution, spatial activity allocation models. Design and analysis of experiments for resource recovery, waste disposal, and transportation planning. Application of matrix algebra in the design and analysis of solid waste processing and resource recovery. Optimization of public service delivery systems, including solid waste collection and disposal, resource recovery, water supply systems, and transportation networks. 3 units. *Pas*

216. Transportation Planning and Policy Analysis. Issues in policy planning and decision making in urban and intercity transportation systems. Transportation legislation. Emphasis on analysis and understanding of government transportation programs and policy. Prerequisite or corequisite: Civil and Environmental Engineering 116 or consent of instructor. (Also listed as Public Policy Studies 254.) 3 units. *Pas*

217. Transportation Systems Analysis. The transportation systems planning process. Quantitative analysis, mathematical modeling and computer simulation techniques for short-and long-range planning and evaluation of transportation systems. Prerequisite or corequisite: Civil and Environmental Engineering 116 or consent of instructor. 3 units. *Pas*

218. Engineering Management and Project Evaluation. Statistical analysis and economics. Data organization, distributions, estimates of parameters, hypothesis testing, analysis of variance. Economic impact assessment, supply and demand forecasting, benefit/cost analysis, economic incentives, public and private finance, input/output analysis. 3 units. *Peirce*

225. Dynamic Engineering Hydrology. Dynamics of the occurrence, circulation, and distribution of water; hydrometeorology; geophysical fluid motions. Precipitation, surface runoff and stream-flow, infiltration, water losses. Hydrograph analysis, catchment characteristics, hydrologic instrumentation, and computer simulation models. Prerequisite: Civil and Environmental Engineering 122 or consent of instructor. 3 units. *Medina or Muga*

226. Operational Hydrology. Frequency, risk, and regional analyses in hydrology. Stochastic processes and mathematical models, correlation and spectral analyses, synthesis of hydrologic data. Linear systems theory applied to the rainfall-runoff process, convolution and the instantaneous unit hydrograph. Criteria for hydrologic instruments and design of optimum networks. Prerequisite: Civil and Environmental Engineering 123 or Mathematics 135 or consent of instructor. 3 units. *Medina*

232. Reinforced Concrete Design. A critical review of research related to the development of existing codes. Special attention is given to the consideration of temperature change effects, shrinkage, plastic flow, bond, and shear and diagonal tension. Two-way slab and flat plate design. Prerequisite: Civil and Environmental Engineering 133. 3 units. *Biswas*

233. Prestressed Concrete Design. A critical review of research and recent developments in prestressed concrete design. Prestressed tanks, beams, and columns; partial prestressing and composite design. Prerequisite: Civil and Environmental Engineering 133. 3 units. *Biswas*

235. Foundation Engineering. An introduction to methods of analysis, design, and construction of foundations. Bearing capacity and settlement of shallow and deep foundations. Soil exploration, excavation and bracing, drainage and stabilization, and underpinning. Foundation vibrations. 3 units. *Staff*

236. Earth Structures. An introduction to methods of analysis, design, and construction of earth structures such as dams, embankments, cuts, canals, and

airfield and highway pavements. Selection of materials, soil compaction, and stabilization. Theory of seepage, design of wells and drainage collectors. Slope stability and related problems. Theory of layered systems and pavement design procedures. 3 units. *Staff*

239. Physical Properties of Soils. Origin of soils, soil minerals, and processes of soil formation; physical chemistry of multiphase systems and soil structure. Permeability and flow of water through soils, capillary and osmotic phenomena, soil compressibility, theory of consolidation, shear strength and failure criteria. Stress-strain relationships, volume changes, and pore pressure during shear strength properties. Advanced laboratory soil testing techniques. 3 units. *Staff*

241. Environmental Engineering Chemistry and Biology. Inorganic and organic chemistry as applied to water and wastewater treatment. Chemical equilibria and kinetics. Population dynamics and energy transfer in metabolic systems. Instrumental analysis, including spectrophotometry, chromatography, and atomic adsorption. Atmospheric chemistry and analytical methods. Prerequisite: Civil and Environmental Engineering 124. 3 units. *Peirce and Vesilind*

243. Unit Operations in Water Treatment. Fundamental bases for design of water and waste treatment systems, including transport, mixing, sedimentation and filtration, gas transfer, coagulation, and biotreatment processes. Prerequisite: Civil and Environmental Engineering 124 or consent of instructor. 3 units. *Vesilind*

245. Pollutant Transport Systems. Distribution of pollutants in natural waters and the atmosphere, diffusive and advective transport phenomena within the natural environment and through artificial conduits and storage/treatment systems. Analytical and numerical prediction methods. Prerequisites: Civil and Environmental Engineering 122 and Mathematics 111 or equivalents. 3 units. *Medina*

246. Water Supply Design. The study of water resources and municipal water requirements including reservoirs, transmission, treatment and distribution systems; methods of collection, treatment, and disposal of municipal and industrial wastewaters. The course includes the preparation of a comprehensive engineering report encompassing all aspects of municipal water and wastewater systems. Field trips to be arranged. Prerequisite: Civil and Environmental Engineering 124 or consent of instructor. 3 units. *Vesilind*

248. Solid Waste and Resource Recovery Engineering. Engineering design of resource recovery systems including traditional and advanced technologies. Sanitary landfills and incineration of solid wastes. Energy recovery and recycling municipal refuse. Collection, treatment, and disposal of solid wastes from wastewater treatment. Prerequisite: Civil and Environmental Engineering 124 or consent of instructor. 3 units. *Vesilind*

249. Control of Hazardous and Toxic Waste. Solutions to industrial and municipal hazardous waste management problems. Handling, transportation, processing, storage and disposal technologies. Upgrading an abandoned disposal site. Economic and regulatory aspects. Case studies. Prerequisite: consent of instructor. 3 units. *Peirce*

251. Systematic Engineering Analysis. Mathematical formulation and numerical analysis of discrete engineering systems with emphasis on theory of structures. Equilibrium and propagation problems in continuum; properties of these systems and their discretization by the trial functions with undetermined parameters. The use of weighted residual methods, finite elements, and finite differences. Prerequisite: senior or graduate standing. 3 units. *Utku*

254. Applications of Finite Element Analysis. Theory of element and material models; models of metals, rock, reinforced concrete, wood, glass, soil, water, and air; analyses of torsion members, shear walls, membranes, plates, shells, solids, and compound structural systems; analysis of soil-structure and fluid-structure systems; prediction of field heating, seepage, and pollution. Prerequisite: Civil and Environmental Engineering 251 or consent of instructor. 3 units. *Melosh*

258. Analysis of Dynamic and Nonlinear Behavior of Structures. Computation of nonlinear response by discretization; models for simulation of geometric, material, and boundary constraint nonlinearities; analysis of limit loads, bifurcations, and snap-through; simulation of super-elastic, plastic, viscoelastic, and slipping materials; prediction of collapsing, ballooning, gapping, metal forming, and welding behavior. Prerequisite: Civil and Environmental Engineering 251 or consent of instructor. 3 units. *Melosh or Ulku*

265. Advanced Topics in Civil and Environmental Engineering. Opportunity for study of advanced subjects relating to programs within the civil and environmental engineering department tailored to fit the requirements of a small group. 1 to 3 units. *Graduate staff*

280. Engineering Aspects of Physical Oceanography. Study of the dynamic ocean processes of concern to the design engineer. Hydrometeorology, surface wind distribution, mechanics of generation and propagation of surface water waves, theory of periodic waves (linear and nonlinear), wave spectral descriptive models, astronomical tides, storm surge, impulsively generated waves (tsunamis), and wind-and wave-induced forces on various obstructions. Attention is focused on hindcasting-forecasting techniques and selection of design (wave spectra) criteria in terms of specified risk levels. 3 units. *Muga*

281. Experimental System Engineering. Formulation of experiments; Pi theorem and principles of similitude; data acquisition systems; static and dynamic measurement of displacement, force, and strain; interfacing experiments with digital computers for statistical data analysis; students select, design, perform, and interpret laboratory-scale experiments in areas of fluid systems including environmental and ocean engineering, and in solid systems including structural and basic material behavior. 3 units. *J. F. Wilson*

282. Port, Harbor, and Coastal Engineering. An intensive study of the various types of marine and coastal structures and their functions. Procedures for developing preliminary design alternatives and final design selection will be illustrated via the case history approach. Structures to be considered include piers (solid and open faced), seawalls and bulkheads, breakwaters, jetties, groins, outfalls, pipelines, moored cable array systems, and floating terminals. Each case history will be followed from conception and initial planning through the design stage to construction and postproject evaluation. Normally, there will be an opportunity to participate in an ongoing project. Prerequisite: Civil and Environmental Engineering 280. 3 units. *Muga*

283. Ocean System Dynamics. Formulation of dynamic models for discrete and continuous structures, normal mode analysis, deterministic and stochastic responses to shocks and environmental loading (earthquakes, winds, and waves), introduction to nonlinear dynamic systems, analysis and stability of structural components (beams and cables and large systems such as offshore towers, moored ships, and floating platforms). 3 units. *J. F. Wilson*

399. Special Readings in Civil and Environmental Engineering. Special individual readings in a specific area of study in civil and environmental engineering. Prerequisite: approval of Director of Graduate Studies. 1 to 3 units. *Graduate staff*

Courses Currently Unscheduled

- 202. Advanced Mechanics of Solids II
- 210. Intermediate Dynamics
- 221. Incompressible Fluid Flow
- 222. Open Channel Flow
- 223. Flow Through Porous Media
- 231. Structural Engineering Analysis
- 234. Advanced Structural Design in Metals
- 238. Rock Mechanics
- 247. Air Pollution Control
- 306. Plasticity
- 336. Advanced Soil Mechanics
- 337. Elements of Soil Dynamics
- 350. Advanced Engineering Analysis

ELECTRICAL ENGINEERING

Professor Casey, *Chairman* (130 Engineering); Professor Marinos, *Director of Graduate Studies* (173 Engineering); Professors Fair, Joines, Kerr, Nolte, Owen, Pilkington, Wang, and T. G. Wilson; Associate Professors Hacker and Trivedi; Assistant Professors Carroll and George

A student may specialize in any one of the following fields in working toward either the M.S. or the Ph.D. degree with a major in electrical engineering: computer-aided design, computer engineering, detection and estimation theory, digital signal processing, electromagnetic fields and microwaves, integrated circuit design and fabrication, microprocessor systems, robotics and control systems, solid-state devices and materials, solid-state power conditioning, and VLSI circuit design.

Recommended prerequisites for the graduate courses in electrical engineering include a knowledge of basic mathematics and physics, electric networks, and system theory. Students in doubt about their background for enrollment in specific courses should discuss the matter with the Director of Graduate Studies. The M.S. degree program includes either a thesis or a project and an oral examination. A qualifying examination is required for the Ph.D. degree program. This examination is intended to test both the breadth and depth of the student's understanding of basic electrical engineering concepts. There is no foreign language requirement.

203. Random Signals and Noise. Introduction to mathematical methods of describing and analyzing random signals and noise. Review of basic probability theory; joint, conditional, and marginal distributions; random processes. Time and ensemble averages, correlation, and power spectra. Optimum linear smoothing and predicting filters. Introduction to optimum signal detection and parameter estimation. 3 units. *Kerr, Nolte, or Wang*

204. Computer Network Architecture. Prerequisites: Computer Science 154 and Electrical Engineering 157. (Also listed as Computer Science 204.) 3 units. *Pitt*

205. Signal Detection and Extraction Theory. Introduction to signal detection and information extraction theory from a statistical decision theory view-

point. Subject areas covered within the context of a digital environment are decision theory, detection and estimation of known and random signals in noise, estimation of parameters and adaptive recursive digital filtering, and decision processes with finite memory. Applications to problems in communication theory. Prerequisite: Electrical Engineering 203 or consent of instructor. 3 units. *Nolte*

206. Digital Signal Processing. Introduction to the fundamentals of processing signals by digital techniques with applications to practical problems. Discrete time signals and systems, elements of the Z-transform, discrete Fourier transforms, digital filter design techniques, fast Fourier transforms, and discrete random signals. 3 units. *Nolte*

207. Fault-Tolerant Computer Systems. Test generation and diagnostic program development for detection and location of faults in digital networks, digital simulation as a diagnostic tool for test generation and verification of the initial system design, design of self-checking and fault-tolerant systems, and effectiveness evaluation of various fault-tolerant schemes. (Also listed as Computer Science 207.) 3 units. *Marinos*

208. Digital Computer Design. Hardware implementation of combinational and sequential switching networks. Arithmetic elements, switching matrices, character generators, counters, and shift registers. Detailed design and simulation of a general-purpose computer system. Computer architectures based on macromodules, hardware compiler implementations, and parallel processing concepts are also discussed. Prerequisite: Electrical Engineering 157 or consent of instructor. (Also listed as Computer Science 208.) 3 units. *Marinos*

209. Microprocessor Fundamentals and Applications. Various state-of-the-art microprocessor chips and their associated instruction sets, microcomputer architectures, comparative study of various microprocessor designs, microprocessor-based system design illustrated by several carefully selected design projects. Prerequisites: Electrical Engineering 157 and consent of instructor. Fall. (Also listed as Computer Science 209.) 4 units. *Marinos*

210. Introduction to VLSI Systems. A study of devices, circuits, fabrication technology, logic design techniques, and system architecture intended to provide the student with an understanding of the underlying physics and design techniques of VLSI systems. Students are required to complete the design of a digital subsystem in NMOS. Prerequisite: Electrical Engineering 157 or 216 or consent of instructor. Spring. 3 units. *Carroll*

211. Quantum Mechanics. Wave mechanics and elementary applications, free particle motion, Schrödinger equation, approximation methods. Fall. 3 units. *Staff*

213. Modern Optics. Optical processes including the propagation of light, coherence, interference, and diffraction. Consideration of the optical properties of solids with applications of these concepts to lasers and modern optical devices. (Also listed as Physics 185.) 3 units. *Hacker or staff*

214. Introduction to Solid-State Physics. Discussion of solid-state phenomena including crystalline structures, thermal properties, free electron theory of metals, and band theory of semiconductors. Emphasis on understanding the electrical, magnetic, and optical properties of solids. Prerequisite: Physics 161 or equivalent. (Also listed as Physics 214.) 3 units. *Hacker or staff*

215. Semiconductor Physics. A quantitative treatment of the physical processes that underlie semiconductor device operation. Topics include: band theory and conduction phenomena; equilibrium and nonequilibrium charge carrier distributions; charge generation, injection, and recombination; drift and diffusion

processes. Prerequisite: Electrical Engineering 211 or consent of instructor. 3 units. *Hacker or Casey*

216. Devices and Processing for Integrated Circuits. Basic operating concepts of the devices that are used in integrated circuits: Schottky-barriers, ohmic contacts, p-n junctions, bipolar transistors, and Si MOS capacitors and field-effect transistors. Device fabrication and processing will also be presented. Selected laboratory work. Fall. 3 units. *Casey*

218. Integrated Circuit Engineering. Basic processing techniques and layout technology for integrated circuits. Photolithography, diffusion, oxidation, ion implantation, and metallization. Design, fabrication, and testing of integrated circuits. Prerequisite: Electrical Engineering 216. 4 units. *Casey or staff*

222. Nonlinear Analysis. Introduction to methods of analyzing engineering systems described by nonlinear differential equations: analytic, numerical, graphical, and series approximation methods; analysis of singular points; stability of nonlinear systems. Applications of various methods, such as the modified Euler, Runge-Kutta, isoclines, perturbation, reversion, variation of parameters, residuals, harmonic balance, Bendixon, and Liapounov to phenomena of nonlinear resonance, subharmonics, relaxation oscillations, and forced oscillating systems. (Also listed as Mechanical Engineering 232.) 3 units. *T. G. Wilson*

224. Advanced Electronic Circuits. Application of discrete and integrated circuits in analog systems. A study of differential, operational, and other multistage amplifiers; frequency response, feedback, compensation techniques, and other topics. Some laboratory and computer simulation work. Prerequisite: Electrical Engineering 161 or equivalent. 3 units. *George*

234. Power Electronics: High-Power Circuits. Basic principles of analysis and design of electronic power control and conversion circuits with particular emphasis on thyristor (SCRs, TRIACs, etc.) circuits. Characteristics of high-power semiconductors, commutating circuits, AC voltage controllers, AC-to-AC controlled rectifiers, DC-to-DC converters, DC-to-AC inverters, AC-to-AC converters. Laboratory. Prerequisite: Electrical Engineering 161 or equivalent. 4 units. *Owen and T. G. Wilson*

235. Nonlinear Magnetic and Semiconductor Power Converters: Design and Control I. Engineering properties of modern soft magnetic materials. Mathematical descriptions of nonlinear magnetic and semiconductor characteristics for transient and steady-state analysis of power electronic circuits. Design of saturable and nonsaturating magnetic devices. State-plane analysis of negative-resistance oscillators and self-oscillating DC-to-AC inverters. Considerations of starting problems, semiconductor switching losses, magnetic core losses, and efficiency. Laboratory. Prerequisites: Electrical Engineering 161 or equivalent and consent of instructor. 4 units. *Owen and T. G. Wilson*

236. Nonlinear Magnetic and Semiconductor Power Converters: Design and Control II. Analysis, design, and control of electronic DC-to-DC power converters utilizing energy storage principles. Optimum configurations, stability, losses, large-signal and small-signal dynamic response, measurement techniques. Special attention given to design of pulse modulated controllers using state-space and frequency-response techniques. Laboratory. Prerequisite: Electrical Engineering 235. 4 units. *Owen and T. G. Wilson*

237, 238. Advanced Power Electronics Laboratory and Seminar. Experiments related to the design, control, measurement, and application of power electronic circuits and systems. Prerequisite: consent of instructor. 3 units each. *Owen and T. G. Wilson*

241. Linear Systems. Modeling of multiple input-output linear systems in the frequency and time domains. Matrix differential and difference equations and their solutions; state variables. Digital simulation of differential systems. Fourier analysis of signals and systems. Transform techniques applied to state variable models. State-space models of distributed systems. 3 units. *Kerr or Wang*

242. Modern Control and Dynamic Systems. (Also listed as Mechanical Engineering 230.) 3 units. *Wright*

250. Introduction to Robotics. Fundamental notions in robotics, basic configurations of manipulator arm designs, coordinate transformations, control of robot actions, robot programming, artificial intelligence; machine vision, force, touch, and other sensory systems; selected laboratory assignments. Prerequisites: Electrical Engineering 112 and consent of instructor. 3 units. *Wang*

251. Pattern Classification and Recognition. Parameter estimation and supervised learning; nonparametric techniques; linear discriminant functions; clustering; language theory related to pattern recognition; examples from areas such as character and severe weather recognition, classification of community health data, recognition of geometrical configurations, algorithms for recognizing low resolution touch-sensor array signatures and 3-D objects. Prerequisite: consent of instructor. 3 units. *Wang*

252. Computer Systems Organization. (Also listed as Computer Science 252.) 3 units. *Trivedi*

265. Advanced Topics in Electrical Engineering. Opportunity for study of advanced subjects related to programs within the electrical engineering department tailored to fit the requirements of a small group. Prerequisites: approval of Director of Graduate Studies and instructor. 3 units. *Staff*

271. Electromagnetic Theory. The classical theory of Maxwell's equations; electrostatics, magnetostatics, boundary value problems including numerical solutions, currents and their interactions, and force and energy relations. Three class sessions. Prerequisite: consent of instructor. 3 units. *Joines or Hacker*

272. Electromagnetic Communication Systems. Review of fundamental laws of Maxwell, Gauss, Ampere, and Faraday. Elements of waveguide propagation and antenna radiation. Analysis of antenna arrays by images. Determination of gain, loss, and noise temperature parameters for terrestrial and satellite electromagnetic communication systems. Prerequisite: Electrical Engineering 164 or 271. 3 units. *Joines*

305. Advanced Topics in Signal Processing. Advanced topics of current research interest selected from the areas of digital signal processing, signal detection theory, and adaptive processing. Selected computer simulations. 3 units. *Nolte*

308. Advanced Topics in Digital Systems. A selection of advanced topics of current research interest to the instructor and the class from the areas of digital computer architectures and fault-tolerant computer design. (Also listed as Computer Science 308.) 3 units. *Marinos*

310. Advanced VLSI Design. Development of the background in the circuit theory of CMOS circuits. Consideration of trade-offs at the circuit level, while maintaining an adequate global perspective. Introduction and use of a symbolic design methodology to link circuit design to the physical topology needed for silicon implementation. Examination of a working symbolic design system and consideration of chip design methodologies. Examples of ICs designed with these techniques. A CMOS-oriented project in software or hardware will be required. Prerequisite: Electrical Engineering 210. 3 units. *Weste*

399. Special Readings in Electrical Engineering. Special individual readings in a specified area of study in electrical engineering. Prerequisite: approval of Director of Graduate Studies. 1 to 3 units. *Graduate staff*

Courses Currently Unscheduled

- 202. System Modeling and Computation**
- 217. Lasers**
- 226. Modeling/Computer-Aided Analysis of Electronic Systems**
- 227. Network Synthesis**
- 243. Advanced Linear Systems Theory**
- 302. Applied Information Theory and Statistical Estimation**
- 317. Quantum Electronics**
- 324. Nonlinear Oscillations in Physical Systems**
- 342. Optimal Control Theory**
- 371. Advanced Electromagnetic Theory**
- 373. Selected Topics in Field Theory**

MECHANICAL ENGINEERING AND MATERIALS SCIENCE

Professor Chaddock, *Chairman* (142A Engineering); Associate Professor Shaughnessy, *Director of Graduate Studies* (056 Engineering); Professors Cocks, Garg, Harman, Pearsall, and Shepard; Associate Professors Elsevier, Jones, Loendorf, and Wright; Assistant Professors Buzzard, Cadien, and Hight; Adjunct Associate Professor Sud

Graduate study is available to students seeking the M.S. and Ph.D. degrees with a major in either mechanical engineering or materials science. Departmental programs of advanced study and research include photovoltaics, control systems, dynamics and vibrations, energy conversion, fluid mechanics, heat and mass transport, mechanical design, thermodynamics, physical metallurgy, corrosion, fracture, and polymer science. The faculty cooperates with faculty members from a number of other departments and schools to establish interdisciplinary research projects and programs of study in areas which include applied mechanics, biomechanics, biomedical materials, environmental quality and control, ocean engineering, systems engineering, engineering and public policy, and transportation systems.

The program includes the opportunity for experimental work as well as theoretical study. A major emphasis is placed upon developing the research ability of the student and relating the program to the evolving needs of modern engineering practice.

202. Engineering Thermodynamics. General thermodynamic relationships and continuum properties of real substances. Availability and second law analysis of energy conversion processes. Low temperatures and the third law of thermodynamics. Reaction and multiphase equilibrium. Statistical thermodynamics of simple systems. 3 units. *Harman*

211. Theoretical and Applied Polymer Science. An advanced course in materials science and engineering, dealing specifically with the structure and properties of polymers. Particular attention is paid to recent developments in the processing and use of modern plastics and fibers. Product design is considered in terms of polymer structures, processing techniques, and properties. 3 units. *Clark or Pearsall*

213. Advanced Materials Science. An in-depth study of current problems in materials applications conducted in a seminar format. Treatment will include thermal, electrical, optical, and magnetic properties of materials in terms of basic physical concepts. Subjects intended to provide materials scientists and engineers with a theoretical basis for understanding and manipulating properties. Prerequisites: Engineering 83 and Mechanical Engineering 111 or 112. 3 units. *Cocks or Shepard*

214. Corrosion and Corrosion Control. Effects of environments on the design and utilization of modern engineering alloys. Theory and mechanisms of corrosion, particularly in seawater and atmospheric environments. Microstructural aspects of diffusion, oxidation, hot corrosion, and stress corrosion. Prerequisite: Engineering 83. 3 units. *Cocks or Jones*

215. Biomedical Materials and Artificial Organs. (Also listed as Biomedical Engineering 215.) 3 units. *Clark*

216. Materials Science and Solar Technology. All aspects of materials science as related to solar energy development. Emphasis is placed on photovoltaic materials and devices, including the relationship of conversion efficiency to material properties and solar cell design. 3 units. *Cocks*

217. Fracture of Engineering Materials. Conventional design concepts and their relationship to the occurrence of fracture. Linear elastic and general yield fracture mechanics. Microscopic plastic deformation and crack propagation. The relationship between macroscopic and microscopic aspects of fracture. Time dependent fracture. Fracture of specific materials. Prerequisites: Engineering 83 and Mechanical Engineering 115. 3 units. *Jones*

218. Thermodynamics and Thermokinetics of Materials. Thermodynamic and thermokinetic fundamentals and their application to materials problems such as alloying, solid solution formation, and mass transport. Topics covered include the laws of thermodynamics, reactions and reaction rates, Gibbs and Helmholtz free energy, chemical potential, phase equilibria in semiconductor and metallic systems, behavior of solutions, phase diagrams, activation energies, and the transport equations. 3 units. *Cadien, Cocks, Jones, Pearsall, or Shepard*

219. Applied Surface Science: Crystal Growth and Analytical Techniques. Fundamentals of surfaces processes and particle-surface interactions. Topics covered include adsorption, accommodation, elemental sticking coefficients, adatom diffusion, nucleation, thin film vapor phase growth (MBE, CVD, sputtering, etc.), and surface spectroscopies (AES, XPS, RBS, SIMS, etc.). 3 units. *Cadien*

221. Compressible Fluid Flow. Basic concepts of the flow of gases from the subsonic to the hypersonic regime. Effects of friction, heat transfer, and shock on one-dimensional inviscid flow. Potential theory, oblique shock waves, and special calculation techniques in two-dimensional flow. 3 units. *Buzzard or Shaughnessy*

222. Heat Transfer. Steady-state and transient solutions of the general heat conduction equation. Development of the equations for transport of energy by fluid motion. Principles of similarity and dimensional analysis in convective energy transport. Solutions of the boundary layer equations. The laws of radiation heat transfer and radiation heat exchange. 3 units. *Buzzard or Chaddock*

223. Principles and Design of Heat Transfer Equipment. Application of theoretical and experimental developments in heat transfer to the design of heat exchangers. Study of fin shapes, finned passages, fouling factors, baffling, and other parameters of heat exchanger design. Analytical and numerical methods for design calculation illustrated with equipment such as furnaces, recuperators,

regenerators, solar collectors, condensers, and evaporators. Prerequisite: Mechanical Engineering 150. 3 units. *Chaddock*

224. An Introduction to Turbulence. Flow instability and the transition to turbulence. Physical characteristics of turbulent flows, averaging, and the Reynolds equation. Turbulent transport and mixing length theories. The statistical description of turbulence, correlations, and spectra. Fourier transforms. Measurement techniques. 3 units. *Shaughnessy*

226. Intermediate Fluid Mechanics. A survey of the principal concepts and equations of fluid mechanics. Fluid properties. Statics. Basic equations for the control volume. The differential equations of fluid motion. Stream function. Irrotational flow. Navier-Stokes equations. Kelvin's and Crocco's theorem. Applications to two-dimensional incompressible potential flow and to viscous flow in boundary layers. 3 units. *Shaughnessy*

227. Advanced Fluid Mechanics. Flow of a uniform incompressible viscous fluid. Exact solutions to the Navier-Stokes equation. Similarity methods. Irrotational flow theory and its applications. Elements of boundary layer theory. Prerequisite: Mechanical Engineering 226 or consent of instructor. 3 units. *Shaughnessy*

230. Modern Control and Dynamic Systems. Dynamic modeling of complex linear and nonlinear physical systems involving the storage and transfer of matter and energy. Unified treatment of active and passive mechanical, electrical, and fluid systems. State-space formulation of physical systems. Time and frequency-domain representation. Controllability and observability concepts. System response using analytical and computational techniques. Lyapunov method for system stability. Modification of system characteristics using feedback control and compensation. Emphasis on application of techniques to physical systems. (Also listed as Electrical Engineering 242.) 3 units. *Garg or Wright*

234. Advanced Computer-Aided Engineering. Advanced concepts and practices of computer-aided engineering (CAE), which includes computer-aided design and computer-aided manufacturing (CAD/CAM). Emphasis on computer graphics, engineering data management, interactive programming, and integrated analysis/design. Students will develop interactive programs that integrate the above areas. Prerequisite: programming capability in FORTRAN. 3 units. *Loendorf*

235. Advanced Mechanical Vibrations. Analytical and experimental procedures applied to design of machines and systems for adequate vibration control. Determination of eigenvalues and eigenvectors by iteration and computer techniques, transfer matrices applied to lumped and distributed systems, analytical and numerical methods of obtaining the pulse response of plane and three-dimensional multi-mass systems, convolution and data processing, introduction to random vibration. 3 units. *Hight*

236. Engineering Acoustics and Noise Control. Specification of the physical properties of noise; noise measurement; and absorption, transmission, and propagation of sound. Effects of noise on humans, noise exposure, and damage risk criteria. Legal aspects of noise control, source modification, enclosures, barriers, and personnel protectors. Prerequisites: Mechanical Engineering 123 and Mathematics 111. 3 units. *Wright*

240. Patent Technology and Law for Engineers. The use of patents as a technological data base is emphasized including information retrieval in selected engineering disciplines. Fundamentals of patent law and patent office procedures. 3 units. *Cocks*

241. Advanced Mechanical Design. A study of those processes in mechanical design which occur after a prototype has been developed. Areas of study may

include prototype testing and evaluation, computer analysis, marketing, CAD, redesign, detail drafting, manufacturing processes for mass production, economic analysis, patents, and entrepreneurial activities. Semester projects using design teams will be used to study these areas. Prerequisite: Mechanical Engineering 141. 3 units. *Hight*

254. Solar Energy Thermal Processes. Solar radiation instrumentation, measurements, data, and estimation. Radiation heat transfer characteristics of opaque materials and partially transparent media. Performance and design calculations for flatplate and focusing collectors. Thermal energy storage. Solar water heating and heating and cooling of buildings. Economics and life cycle costing studies for solar installations. Survey of research, development, and demonstration projects on solar thermal processes. 3 units. *Chaddock*

265. Advanced Topics in Mechanical Engineering. Opportunity for study of advanced subjects related to programs within mechanical engineering tailored to fit the requirements of a small group. Prerequisites: approval of Director of Undergraduate or Graduate Studies and instructor. 1 to 3 units. *Staff*

267. Energy Use in Educational Facilities. Heat transfer theory and the thermal properties of buildings and building materials. Environmental control, including psychometric theory, physiological requirements, and mechanical equipment for heat ventilating and air conditioning. Applications to planning and management of educational facilities. Not for engineering majors. 3 units. *Harman and Pittillo*

277. Optimization Methods for Mechanical Design. Definition of optimal design. Methodology of constructing quantitative mathematical models. Nonlinear programming methods for finding "best" combination of design variables: minimizing steps, gradient methods, flexible tolerance techniques for unconstrained and constrained problems. Emphasis on computer applications and term projects. Prerequisite: consent of instructor. 3 units. *Wright*

302. Advanced Thermodynamics. Classical thermodynamics of inherently irreversible processes. Quantum and statistical thermodynamic analysis of properties of real substances and processes. Principles of general thermodynamics. 3 units. *Harman*

323. Convective Heat Transfer. Models and equations for fluid motion, the general energy equation, and transport properties. Exact, approximate, and boundary layer solutions for laminar flow heat transfer problems. Use of the principle of similarity and analogy in the solution of turbulent flow heat transfer. Two-phase flow, nucleation, boiling, and condensation heat and mass transfer. Prerequisite: Mathematics 285. 3 units. *Chaddock*

324. Conduction and Radiation Heat Transfer. Conduction heat transfer in steady and transient state. Radiation exchange involving absorbing and emitting media including gases and flames, combined conduction and radiation, and combined convection and radiation. Exact and approximate methods of solution including separation of variables, transform calculus, numerical procedures, and integral and variational methods. Prerequisites: Mathematics 230 and Mechanical Engineering 222 or equivalent. 3 units. *Buzzard*

399. Special Readings in Mechanical Engineering. Individual readings in advanced study and research areas of mechanical engineering. Prerequisite: approval of Director of Graduate Studies. 1 to 3 units. *Staff*

Courses Currently Unscheduled

210. Intermediate Dynamics

231. Systems Response and Control

- 232. Nonlinear Analysis
- 280. Nuclear Reactor Power Cycles
- 300. Advanced Projects in Mechanical Engineering
- 311. Behavior of Crystalline Solids
- 321. Gas Dynamics
- 322. Mechanics of Viscous Fluids
- 327. Homogeneous Turbulence
- 328. Turbulent Shear Flow
- 331. Nonlinear Control Systems
- 333. Seminar in Control Systems
- 335. Analytical Methods in Vibrations
- 372. Finite Element Techniques in Design

English

Professor Gleckner, *Acting Chairman* (323 Allen); Associate Professor DeNeef, *Director of Graduate Studies* (316 Allen); Professors Anderson, Budd, Cady, Duffey, Ferguson, Monsman, Nygard, Randall, Ryals, Smith, G. Williams, and K. Williams; Associate Professors Butters, Gerber, Jackson, Jones, Mellow, and Strandberg; Assistant Professor Porter; Visiting Professor Robertson

The department offers graduate work leading to the A.M. and Ph.D. degrees. A statement of the requirements for the A.M. and Ph.D. degrees may be obtained from the Director of Graduate Studies. The department requires a reading knowledge of one foreign language for the A.M. degree; for the Ph.D. degree, two languages determined by the student's committee.

For Seniors and Graduates

207. Old English Language and Literature. The pre-Conquest language and representative prose and poetry. (Also listed under Medieval and Renaissance Studies.) 3 units. *Nygard*

208. History of the English Language. Introductory survey of the changes in sounds, forms, and vocabulary of the English language from its beginning to the present, with emphasis on the evolution of the language as a medium of literary expression. (Also listed under Medieval and Renaissance Studies.) 3 units. *Nygard*

209. Present-Day English. A survey of contemporary linguistic theories applied to modern English; designed for students of literature and teachers of English. 3 units. *Butters or Nygard*

212. Middle English Literature: 1100 to 1500. Selected topics. (Also listed under Medieval and Renaissance Studies.) 3 units. *Nygard*

221. Renaissance Prose and Poetry: 1500 to 1660. Selected topics. (Also listed under Medieval and Renaissance Studies.) 3 units. *DeNeef, Randall, or G. Williams*

225. Renaissance Drama: 1500 to 1642. Selected topics. (Also listed under Medieval and Renaissance Studies.) 3 units. *Randall or G. Williams*

235. Restoration and Eighteenth-Century Literature: 1660 to 1800. Selected topics. 3 units. *Ferguson or Jackson*

241. **Romantic Literature: 1790 to 1830.** Selected topics. 3 units. *Gleckner, Jackson, or Monsman*
245. **Victorian Literature: 1830 to 1900.** Selected topics. 3 units. *Monsman or Ryals*
251. **British Literature since 1900.** Selected topics. 3 units. *Mellown or Smith*
263. **American Literature to 1865.** Selected topics. 3 units. *Anderson or Jones*
267. **American Literature: 1865 to 1915.** Selected topics. 3 units. *Budd, Cady, or K. Williams*
275. **American Literature since 1915.** Selected topics. 3 units. *Duffey or Strandberg*
287. **Major Critical Thought.** A study of major figures in the history of literary criticism. 3 units. *Duffey*

For Graduates

312. **Studies in Middle English Literature.** (Also listed under Medieval and Renaissance Studies.) 3 units. *Nygard*
315. **Studies in Chaucer.** (Also listed under Medieval and Renaissance Studies.) 3 units. *Nygard or Robertson*
321. **Studies in Renaissance Literature.** (Also listed under Medieval and Renaissance Studies.) 3 units. *DeNeef, Randall, or G. Williams*
324. **Studies in Shakespeare.** (Also listed under Medieval and Renaissance Studies.) 3 units. *G. Williams or Porter*
329. **Studies in Milton.** (Also listed under Medieval and Renaissance Studies.) 3 units. *DeNeef*
337. **Studies in Augustanism.** 3 units. *Ferguson or Jackson*
338. **Studies in a Major Augustan Author.** 3 units. *Ferguson, Gleckner, or Jackson*
341. **Studies in Romanticism.** 3 units. *Gleckner, Jackson, or Monsman*
347. **Studies in Victorianism.** 3 units. *Monsman or Ryals*
348. **Studies in a Major Nineteenth-Century Author.** 3 units. *Gleckner, Jackson, Monsman, or Ryals*
353. **Studies in Modern British Literature.** 3 units. *Mellown or Smith*
361. **Studies in American Literature before 1915.** 3 units. *Anderson, Budd, Cady, Jones, or K. Williams*
375. **Studies in Modern American Literature.** 3 units. *Duffey or Strandberg*
376. **Studies in a Modern Author (British or American).** 3 units. *Duffey, Mellown, Smith, or Strandberg*
381. **Special Topics Seminar.** 3 units. *Staff*
383. **Studies in Textual Criticism.** 3 units. *G. Williams*
385. **Studies in Literary Criticism.** 3 units. *Staff*
390. **Seminar in the Teaching of Composition.** Required of newly appointed tutors in English during their first semester of teaching at Duke; admission also by consent of instructor. 3 units, ungraded. *Staff*
392. **Tutorial in Journal Editing.** Systematic exposure to all phases of academic journal editing. Permission of instructor required. (Also listed as History 392.) 3 units, ungraded. *Ferguson or Watson (history)*

COURSES CURRENTLY UNSCHEDULED

- 280. Introduction to Folklore
- 310. Studies in Old English Literature
- 368. Studies in a Major American Author before 1915
- 380. Studies in Ballad and Folksong

TUTORIALS

Specialized subjects of study will be offered, numbered in the 390s, to accommodate the interests of advanced graduate students. Tutorials will be offered to single students or to small groups. Instruction will be conducted in weekly sessions, or in more frequently scheduled sessions, if the instructor wishes. Emphasis will be on independent reading and investigation, and oral and written reports. A substantial amount of writing will be required.

Students are advised to consult the Director of Graduate Studies for a list of tutorials currently scheduled to be offered. 3 units. *Staff*

Forestry and Environmental Studies

Professor Jayne, *Dean* (216 Biological Sciences); Professor Stambaugh, *Director of Graduate Studies* (011 Biological Sciences); Professors Barnes, Hellmers, Knoerr, Philpott, and Ralston; Associate Professors Christensen, Richardson, and Vesilind; Assistant Professors Boyd, Di Giulio, Hyde, Maguire, Marin, Reckhow, and Royer; Professor Emeritus Anderson; Adjunct Professors Boyce, Condrell, Hart, and Sizemore; Adjunct Associate Professor Dutrow; Adjunct Assistant Professor Vasievich; Research Associate Binkley

Major and minor work is offered in the areas of natural resource science/ecology, natural resource systems science, and natural resource economics/policy. Programs of study and research lead to the A.M., M.S., and Ph.D. degrees. College graduates who have a bachelor's degree in one of the natural or social sciences, forestry, engineering, business, or environmental science will be considered for admission to a degree program. Students will be restricted to the particular fields of specialization for which they are qualified academically. Graduate School programs usually concentrate on some area of natural resource science/ecology, systems science, or economics/policy, while study in resource management is more commonly followed in one of the professional master's degree programs of the School of Forestry and Environmental Studies. For more complete program descriptions and information on professional training in forestry or environmental studies, the *Bulletin of Duke University: School of Forestry and Environmental Studies* should be consulted.

The specific degrees available in forestry and related natural resources through the Graduate School are: the A.M. (with or without a thesis), M.S. (with a thesis), and the Ph.D. Students majoring in forestry or environmental studies may be required to demonstrate satisfactory knowledge of one or two foreign languages for the Ph.D. degree. More information on degree and language requirements can be found in the program information section of the bulletin.

NATURAL RESOURCE SCIENCE/ECOLOGY

- 207. Biology of Forest Insects and Diseases. 4 units. *Stambaugh*
- 211. Resource Ecology and Ecosystem Analysis. 4 units. *Richardson*
- 212. Ecosystem Dynamics in Silviculture. Information about forest ecosystems is integrated with silviculture to form a decision and control process for

producing biologically possible combinations of benefits. Principles of cybernetics and system dynamics are used in the analytic techniques. Prerequisite: Forestry and Environmental Studies 213 or equivalent. 3 units. *Boyce*

213. Silviculture. Consideration of the decision-making processes by which prescriptions are formulated for regeneration, tending, and harvesting of forest stands. Biological features underlying stand manipulation are stressed and economic, harvesting, and utilization variables are discussed as appropriate. Emphasis on principles and techniques that transcend vegetational types or geographic regions. Prerequisite: Forestry and Environmental Studies 211 or equivalent. 4 units. *Davis*

214. Tree Biology. 3 units. *Barnes*

215. Forest Entomology. Prerequisite: Forestry and Environmental Studies 207 or equivalent or consent of instructor. 4 units. *Staff*

216. Forest Pathology. Prerequisite: Forestry and Environmental Studies 207 or consent of instructor. 3 units; 4-5 units with laboratory modules. *Stambaugh*

218. Barrier Island Ecology. See course description for Botany 218. Prerequisite: course in general ecology. Offered at Beaufort. (Also listed as Marine Sciences 218.) 6 units. *Staff*

220L. Soil Classification and Interpretation. 4 units. *Ralston*

221L. Silvics and Measurement of Forest Vegetation. Introduction to silvical characteristics; identification and analysis of forest vegetation including comparative growth patterns of different species. Methods of measuring volume and growth of trees and stand, and assessing forest product quality. Emphasis on field techniques and subsequent analysis and interpretation of mensurational data. 4 units. *Davis*

224. Ecological Toxicology. The study of environmental contaminants from a broad perspective, encompassing both ecological and toxicological principles and methodologies. Emphasis upon sources, environmental transport and transformation phenomena, accumulation in biota and ecosystems, and impacts at biochemical through ecosystem levels of organization. Prerequisites: general ecology and vertebrate physiology or consent of instructor. 3 units. *Di Giulio*

226. Forest Ecosystems. Interactions of forest vegetation, animals, and the environment are viewed in a systems context. Topics include historical development of forest ecology; environmental driving forces of precipitation and radiation; within-ecosystem transfers of water, energy, and nutrients; conceptual properties of forest ecosystems; and the impacts of forest management practices. 4 units. *Binkley*

230. Weather and Climate. 4 units. *Knoerr*

231. Environmental Climatology. Applications of climatology to solving problems in ecology and natural resource management. History of the atmosphere and world climates is considered to provide a perspective on current conditions. Impact of weather on human behavior and natural resource management. 3 units. *Staff*

232. Microclimatology. 3 units. *Knoerr*

234. Watershed Hydrology. Introduction to the hydrologic cycle with emphasis on the influence of land use, vegetation, soil types, climate, and land forms on water quality and quantity, and methods for control. Development of water balance models. Analysis of precipitation patterns, rainfall and runoff, and nonpoint source impacts. Statistical handling and preparation of hydrologic data,

simulation and precipitation models, introduction to groundwater flow, laboratory and field sampling methods. 4 units. *Marin*

236. Water Quality Management. 3 units. *Reckhow*

238. Limnological Principles of Aquatic Resource Management. Analysis of resource problems arising from human use and interaction with water resources. Chemical, biological, and physical limnological processes are considered in relation to introduction of toxicants and nutrients into aquatic systems, removal or addition of biotic components, modification of the physical environment, and other current concerns. Prerequisite: a course in aquatic ecology or consent of instructor. 4 units. *Staff*

303. Seminar in Ecotoxicology. Discussion of current topics concerning environmental contaminants. Individual students review a chosen topic and lead subsequent discussion. Guest speakers. 1 unit. *Richardson and Di Giulio*

309. Chemical Aspects of Forest Protection. Chemical aspects of organisms attacking trees and of materials used in their control. Emphasis on structures and properties in relation to functions and uses. Prerequisite: Forestry and Environmental Studies 207. 3 units. *Barnes*

310. Forest Productivity and Mineral Cycling. An ecosystem approach to studying the processes affecting productivity and mineral cycling in the world's forests. Emphasis on primary production, biomass accumulation, and biogeochemical cycling as affected by edaphic and climatic conditions. Concepts of ecosystem analysis and research methodology are stressed. Prerequisite: consent of instructor; course work in plant physiology, soils, and statistics is recommended. 3 units. *Richardson and Binkley*

313. Wildland and Wildlife Management. Overview of wildlife management in relation to land use, properties of wildlife populations, elements of game range, manipulation of food and cover, agencies involved in wildlife conservation, and the role of public and political involvement. Taught in the spring semester. 3 units. *Staff*

315. Ecology of Tree Diseases. Fundamentals of phytopathology as applied to field and laboratory investigations of tree diseases and wood degradation; biological interpretation of host-pathogen-environment interaction is stressed in literature review, experimentation, and scientific writing. Prerequisite: consent of instructor. 4 units. *Stambaugh*

316. Seminar in Forest Protection. Current problems in forest and shade tree protection and research applications in entomology, pathology, and physiology as related to natural resource management. Prerequisite: consent of instructor. 1 unit. *Stambaugh*

317. Seminar in Integrated Case Studies in Natural Resource Analysis. Examination and analysis of the integrated case study for solving resource and environmental problems. Prerequisite: consent of instructor. 1 unit. *Richardson*

318. Seminar in Forest Resource Management. Examination and analysis of techniques employed in the management of industrial and public forests, particularly in the South. Discussion of problems of large-scale intensive forest management. Prerequisites: Forestry and Environmental Studies 213 and 274 or equivalents. 1 unit. *Staff*

319. Seminar in Natural Resource Ecology. Discussion of current ecological and environmental problems and research topics related to the management of natural resources. Units to be arranged. *Staff*

324. Wetlands Ecology. The study of bogs, fens, marshes, and swamps. Emphasis on processes within the ecosystem: biogeochemical cycling, decomposi-

tion, hydrology, and primary productivity. Ecosystem structure, the response of these systems to perturbations, and management strategies are discussed. A research project is required. Prerequisites: Forestry and Environmental Sciences 211 or equivalent and consent of instructor. Taught in the spring semester, odd-numbered years. 3 units. *Richardson*

328. Forest Soil Fertility. Relationships of soil fertility factors to the growth of forest stands. Soil chemical properties and biological processes affecting mineral nutrition of trees. Soil amendment practices, including forest fertilization and land disposal of municipal wastes. Laboratory analysis of chemical composition of soil, water, and plant tissue samples. Prerequisite: Forestry and Environmental Studies 220. 4 units. *Ralston*

330L. Environmental Monitoring and Instrumentation. Methods of measuring and monitoring the earth's physical environment with emphasis on water and air resources. Characteristics and uses of contemporary sensors; measurement and data acquisition systems. Methods of obtaining and processing computer compatible data records. Includes laboratory. Taught in the spring semester. (Also listed as Botany 330L.) 4 units. *Knoerr*

349. Integrated Case Studies in Toxicology. Students are assigned topics relative to their chosen research discipline in toxicology and are asked to develop case studies to present at a roundtable workshop. Emphasis on review and analysis of toxicological problems from a holistic (multidisciplinary) viewpoint. 1 unit. *Richardson or Di Giulio*

NATURAL RESOURCES SYSTEMS SCIENCE

252. Computer Applications in Forestry. Overview of the applications of computer technology to problems in forest management. Review of hardware and software capabilities; procedures for planning and implementation, practical applications in forestry operations. 2 units. *Vasievich*

256. Remote Sensing for Resource Management. 3 units. *Davison*

259. Computer Programming for Resource Management. Introduction to computer programming with applications in optimization, simulation, and use of probability models. Taught in first half of semester and followed by Forestry and Environmental Studies 260. Prerequisite: calculus. 2 units. *Boyd*

260. Natural Resource Data Analysis. Elements of statistical inference and estimation including exploratory data analysis, regression, analysis of variance. Introduction to matrix algebra. Taught in second half of semester. Prerequisite: calculus. 2 units. *Jayne and Reckhow*

262. Applied Population Ecology. 3 units. *Staff*

263. Harvesting and Transportation Systems. Analysis of cable, tractor, and aerial harvesting systems. Sawlog and pulpwood transportation. Emphasis on material flow, inventory control. Application of simulation and optimization methods to harvesting, loading, and transport. Offered only in first half of semester and followed by Forestry and Environmental Studies 264. 2 units. *Jayne*

264. Manufacturing Systems. Study of material processing in sawmills, pulp mills, plywood plants, and composite board manufacturing facilities. Emphasis on material flow, quality control, inventory control. Application of quantitative methods and economic analysis to forest product manufacturing operations. Offered in second half of semester. 2 units. *Jayne*

311. Choices in Silviculture. An applied course in which information for silviculture, wildlife habitats, hydrology, economics, and other forestry areas is

translated into quantitative terms and analyzed with systems dynamics techniques to aid decision making. Computer and programming experience is helpful, but not required. Taught in the fall semester. (Intensive one-week course.) 1 unit. *Boyce*

325. Forest Yield. Productivity of forest trees and stands, particularly as a function of silvicultural manipulation; analysis of stand responses such as growth rate, stem form, tree quality, product quality and value. One or more growth models are assessed for biological reality and usefulness to forest managers. Taught in the fall semester, odd-numbered years. Prerequisite: Forestry and Environmental Sciences 213. 3 units. *Davis*

331. Water Resource Systems. Introduction to the fundamentals of water resource systems planning and management. Emphasis on optimization, simulation, statistical and economic principles for management of surface and subsurface water resources. Topics include project selection and evaluation, design of standards and regulations, stochastic and deterministic quantity/quality simulation models, water supply and waste water treatment technologies, decision and risk analysis. Taught in the spring semester. 3 units. *Marin*

350. Statistical Estimation and Inference for Resource Management. Regression analysis with nonexperimental data, simultaneous equations, time series analysis using Box-Jenkins methods. Emphasis on natural resource management applications and inferences for policy evaluation and planning. Includes laboratory. Taught in the spring semester. 4 units. *Reckhow*

353. Analysis of Resource Systems. Introductory survey of linear and nonlinear difference and differential equations important in resource management and environmental decision making. Graphical, analytic, and numerical methods of solution, determination of equilibrium and stability, oscillatory and chaotic systems, boundary value problems. Prerequisite: consent of instructor. 3 units. *Boyd*

354. Quantitative Ecology for Resource Management. Application of quantitative methods, including statistics and computer simulation, to a resource problem. Class project in a local ecosystem. Project objectives emphasize data collection, analysis, and presentation. Taught in the spring semester. Prerequisites: background in ecology and statistics and FORTRAN programming and consent of instructor. 3 units. *Maguire*

355. Optimization Methods for Resource Management. Introductory survey of optimization techniques useful in resource management and environmental decision making. Numerical techniques for unconstrained optimization, linear programming, dynamic programming, and optimal control methods. Prerequisite: consent of instructor. 3 units. *Boyd*

368. Seminar in Water Quality Modeling. Study of existing water quality simulation models using sensitivity analysis and experimental design. Taught in the spring semester. 1 unit. *Reckhow*

NATURAL RESOURCE/ECONOMICS POLICY

270. Resource Economics and Policy. 4 units. *Hyde*

283. Environmental Policy and Values. Prerequisite: consent of instructor. 3 units. *Royer*

381. Natural Resource Policy. An examination of institutions and processes in the public sector that influence natural resource allocation and use of the environment. Emphasis on political allocation of resources, especially legislative

and administrative processes. Current natural resource and environmental policy is briefly surveyed. Prerequisite: Forestry and Environmental Sciences 270. 3 units. *Royer*

382. Environmental Perspectives: Risks, Rights, Regulations. Study of current societal concern pertaining to environmental risks, the process of their regulation in a representative democracy, and the socioeconomic consequences of government regulatory policies. 3 units. *Staff*

388. Seminar in Resource and Environmental Policy. Discussion of the political, legal, and socioeconomic aspects of public and private action in environmental quality control and management. Prerequisites: Forestry and Environmental Studies 270 and consent of instructor. 1 unit. *Staff*

SPECIAL STUDIES AND PROJECTS

201. Field Studies. Credit to be arranged. *Staff*

202. Student Projects. A group of five or more students may plan and conduct their own research project on a special topic, not normally covered by courses or seminars. A request to establish such a project should be addressed to the Dean with an outline of the objectives and methods of study and a plan for presentation of the results to the school. The Dean will designate the units to be earned and a faculty member for the evaluation and grading of the work of each participant. *Staff*

290. Practicums in Resource Management. Professional level problem solving in aspects of resource management with emphasis on field and laboratory work. Variable topics to be announced in spring each year. Some sections may require travel and students may be assessed a fee to cover expenses. Prerequisite: consent of instructor prior to registration. 3 units. *Staff*

299. Independent Projects. Directed readings or research at the graduate level to meet the needs of individual students. Units to be arranged. *Staff*

COURSES CURRENTLY UNSCHEDULED

312. Forest Biochemistry

322. Microbiology of Forest Soils

338. Micrometeorology and Biometeorology Seminar

377. Seminar in Natural Resource Allocation and Efficiency

The University Program in Genetics

Professor Gillham, *Director* (zoology); Professors Amos (microbiology and immunology), Antonovics (botany), Boynton (botany), Burns (microbiology and immunology), Counce (anatomy), Gross (biochemistry), Guild (biochemistry), Joklik (microbiology and immunology), Moses (anatomy), Nicklas (zoology), C. Ward (zoology), F. Ward (microbiology and immunology), and Webster (biochemistry); Associate Professors Bastia (microbiology and immunology), Greene (biochemistry), and Modrich (biochemistry); Assistant Professors Burdett (microbiology and immunology), Endow (microbiology and immunology), Greenleaf (biochemistry), M. Hershfield (biochemistry), Holmes (biochemistry), Hsieh (biochemistry), Kredich (biochemistry), Schachat (anatomy), Steege (biochemistry), and Uyenoyama (zoology); Adjunct Professors Drake (National Institute of Environmental Health Sciences), Judd (National Institute of Environmental Health Sciences), and Lucchesi (University of North Carolina)

The University Program in Genetics provides a coherent course of study in all facets of biology related to genetics. Graduate students registered in any of the biological sciences departments may apply to the faculty of the genetics program to pursue study and research leading to an advanced degree. It would be helpful if applicants for admission to the Graduate School indicated their interest in the genetics program at the time of application. Requests for information describing more completely the research interests of the staff, facilities, and special stipends and fellowships should be addressed to the Director, Genetics Program (Department of Zoology).

For Seniors and Graduates

215. Molecular Genetics I: Genetic Mechanisms. Genetic mechanisms in molecular terms emphasizing gene function, segregation, and regulation in prokaryotes and eukaryotes. Systems covered include bacterial viruses, bacteria, plasmids, cellular organelles, and selected lower and higher eukaryotes. Course material will be drawn from the original literature. Prerequisite: introductory biochemistry. (Also listed as Biochemistry 215.) 3 units. *Gross and staff*

264S. Chromosomes, DNA, and Evolution. The impact of chromosome and DNA-sequence organization on evolution and vice versa: karyotype changes and speciation; repetitive DNA, split genes, jumping genes, and evolutionary mechanisms; the evolution of mitosis and the chromosome cycle. Prerequisite: cell biology or genetics. (Also listed as Microbiology and Immunology 264S and Zoology 264S.) 3 units. *Endow and Nicklas*

268. Molecular Biology II: Nucleic Acids. Structure and metabolism of nucleic acids in the context of their biological function in information transfer. Prerequisites: introductory biochemistry and Molecular Biology I or consent of instructor. (Also listed as Biochemistry 268, Botany 268, and Microbiology and Immunology 268.) 3 units. *Modrich and staff*

280. Principles of Genetics. Structure and properties of genes and chromosomes in individual organisms and in populations. Prerequisites: introductory biology and Chemistry 12 and Mathematics 31 or equivalents. (Also listed as Botany 280 and Zoology 280.) 3 units. *Antonovics, Boynton, and Gillham*

283. Extrachromosomal Inheritance. Genetics, biochemistry, and molecular biology of the organelles of eukaryotic cells, bacterial plasmids and episomes, and cellular symbionts. Emphasis on recent literature. Prerequisite: introductory genetics. (Also listed as Zoology 283 and Botany 283.) 3 units. *Boynton and Gillham*

285. Ecological Genetics. Interaction of genetics and ecology and its importance in explaining the evolution, diversity, and distribution of plants and animals. Prerequisites: Botany 280 and 286 or equivalents. (Also listed as Botany 285S.) 3 units. *Antonovics*

286. Evolutionary Mechanisms. Population ecology and population genetics of plants and animals. Fitness concepts, life history evolution, mating systems, genetic divergence, and causes and maintenance of genetic diversity. Complements Zoology 235. Prerequisites: college biology and Genetics 280 or equivalent. (Also listed as Botany 286 and Zoology 286.) 3 units. *Antonovics and H. Wilbur*

For Graduates

336. Immunogenetics. Antigens of tissues and organs, distribution, extraction, and chemistry. Phylogeny of iso-antigenic systems of humans and animals. Tests for histocompatibility including lymphocyte interactions and reactivity. Change in antigenicity and immune responsiveness in carcinogenesis. Immunologic factors in pregnancy and in homotransplantation of organs. (Also listed as Microbiology and Immunology 336.) 2 units. *Amos and Ward*

350. Genetics Colloquium. Lectures, discussion sessions, and seminars on selected topics of current interest in genetics. Required of all students specializing in genetics. Prerequisites: a course in genetics and consent of instructor. 1 unit. *Counce and staff*

Geology

Professor Perkins, *Chairman* (119 Museum, East); Professor Heron, *Director of Graduate Studies* (114 Museum, East); Professor Pilkey; Associate Professor Rosendahl; Assistant Professor Baker

The Department of Geology offers graduate work leading to the M.S. and Ph.D. degrees. An undergraduate degree in geology is not a prerequisite for graduate studies, but a student must have had or must take a summer field geology course (or equivalent experience), mineralogy, lithology, stratigraphy, paleontology, and structural geology. In addition, the student must have had one year of college chemistry, one year of college physics, and mathematics through calculus.

Graduate courses in the Department of Geology provide specialized training in the fields of facies analysis, geological oceanography, sedimentary petrology, paleobiology, geophysics, and low-temperature geochemistry.

An acceptable thesis is required. There is no language requirement for the M.S. degree.

For Seniors and Graduates

200. Beach and Coastal Processes. The study of sediments, sedimentary processes, and geomorphology of nearshore environments. 3 units. *Pilkey*

205. Geological Oceanography. Broad geologic aspects of the ocean basins, including origin, bottom physiology, sediment distribution, and sedimentary processes. Field observations; sampling procedures. Not open to students who have completed Geology 206S. Offered at Beaufort. (Also listed as Marine Sciences 205.) 6 units. *Pilkey*

206S. Principles of Geological Oceanography. A survey of geological aspects of the oceans including sediment types, processes of sedimentation, geologic structures of the ocean basins, and bottom physiography. Prerequisite: Geology 108 or consent of instructor. 3 units. *Pilkey*

208S. Paleoceanography. Application of stratigraphic, paleontologic, and geochemical evidence in sediments to understanding ancient oceans and climates. Prerequisite: Geology 206S or consent of instructor. 3 units. *Baker*

211S. Stratigraphic Principles and Application. Prerequisites: Geology 72 and 108 or consent of instructor. 3 units. *Perkins*

212. Carbonate Facies Analysis: Recent and Ancient. Origin, distribution, and diagenetic alteration of recent carbonate sediments and their ancient analogs. Prerequisite: Geology 211S. 3 units. *Perkins*

214S. Sedimentary Petrography. Descriptive and interpretive analysis of sediments and sedimentary rocks in thin section, with an emphasis on diagenesis. Prerequisite: consent of instructor. 3 units. *Perkins*

215. Clastics Facies Analysis: Recent and Ancient. Modern clastic depositional systems and their ancient analogs. Prerequisite: Geology 211S. 3 units. *Heron*

216. Field Analysis of South Florida Carbonates. Analysis of recent sediments and organisms and their Pleistocene analogs. One-week field trip. Prerequisite: Geology 211S or consent of instructor. 1 unit. *Perkins*

217. Field Analysis of Ancient Sedimentary Sequences. Regional analysis of ancient clastic and carbonate systems. One-week field trip. Prerequisite: Geology 211S or consent of instructor. 1 unit. *Heron or Perkins*

229. Economic Geology. Principles and processes involved when elements are concentrated to economic proportions in magmatic, metamorphic, hydrothermal, sedimentary, or surface environments. Prerequisite: Geology 102. 3 units. *Staff*

230. Principles of Structural Geology. Description, origin, and interpretation of primary and secondary geologic rock structures. Prerequisites: Geology 106 and 108. 3 units. *Rosendahl*

243S. Microfossils. Readings and laboratory. Prerequisite: Geology 140S or consent of instructor. 3 units. *Staff*

245. Invertebrate Paleozoology. Biologic and stratigraphic relationships of invertebrates and their phylogeny. Lectures and laboratory. Prerequisite: Geology 72 or consent of instructor. 3 units. *Staff*

247. Paleoecology. Prerequisite: Geology 108 and 140S or consent of instructor. 3 units. *Staff*

250. Introduction to Marine Geophysics. Topics include seismic reflection and refraction, magnetics, gravity, and seismology. Prerequisite: introductory physics or consent of instructor. Offered at Beaufort. (Also listed as Marine Sciences 250.) 6 units. *Rosendahl*

251. Physics of the Earth. Origin, primeval evolution, rotation, potential fields, paleomagnetism, gravity anomalies, earthquake seismology, thermal properties, internal structure of the earth, and thermodynamics of plate motions. Prerequisites: Geology 1 and Chemistry 12 and Mathematics 32 and Physics 52 or consent of instructor. 3 units. *Rosendahl*

252. Exploration Seismology. Elastic wave theory, reflection and refraction of acoustic waves, field methodologies, computer processing, and interpretation of seismic data. Prerequisites: Geology 1 and Mathematics 32 and Computer Science 51 and Physics 52 or consent of instructor. 3 units. *Rosendahl*

253S. Geophysics. Current topics. Prerequisite: consent of instructor. 3 units. *Rosendahl*

254. Geophysical Field Methods. Acquisition and processing of geophysical data with special emphasis on seismic techniques. Prerequisite: consent of instructor. 3 units. *Rosendahl*

260S. Hydrocarbon Exploration. Origin, migration, and accumulation of hydrocarbons with emphasis on exploration techniques. Prerequisites: Geology 211S and 251. 3 units. *Perkins and Rosendahl*

270. Geochemistry. Application of chemical principles to geological problems. Prerequisites: Chemistry 12 and Mathematics 32. 3 units. *Baker*

271. Low-Temperature Geochemistry. Chemistry of aqueous solutions, authigenic minerals, surfaces, and stable isotopes in sedimentary systems. Prerequisite: Geology 270 or consent of instructor. 3 units. *Baker*

For Graduates

371, 372. Advanced Topics in Geology. To meet the individual needs of graduate students for independent study in various environmental sedimentary fields. 1 to 3 units. *Staff*

COURSES CURRENTLY UNSCHEDULED

213. Sedimentology

235S. Global Tectonics

Germanic Languages and Literature

Associate Professor Borchardt, *Chairman and Director of Graduate Studies* (106 Languages); Professors Jantz and Phelps; Associate Professors Alt and Rolleston; Assistant Professor Rosenberg

The Department of Germanic Languages and Literature offers graduate work leading to the A.M. degree. Students who expect to major in German should have had sufficient undergraduate courses in Germanic languages to enable them to proceed to more advanced work.

Students who wish to take courses in German as a related field should normally have completed a third-year course (in exceptional cases, a second year) of college German with acceptable grades.

For Seniors and Graduates

200S. Proseminar. Fundamental course for advanced study of German; literary history, schools of criticism, practical exercises in interpretation, and research methods. 3 units. *Borchardt or Alt*

201S, 202S. Goethe. His life and works, in the light of his lasting significance to Germany and world literature. 201S: lyrics, prose, fiction, and selected dramas. 202S: *Faust I and II*. 3 units each. *Jantz or Phelps*

205, 206. Middle High German. The language and literature of Germany's first classical period. (Also listed under Medieval and Renaissance Studies.) 3 units each. *Rosenberg*

207S. German Romanticism. The principal writers of the period from 1795 to 1830. 3 units. *Rolleston or Alt*

209S. Drama. Studies in the German-speaking theater with emphasis on the nineteenth century. 3 units. *Alt*

211S. Nineteenth-Century Literature. From the end of romanticism through realism. 3 units. *Alt*

213S. Hofmannsthal-Rilke-Benn. Struggles, scope, and stages of the literary career in the twentieth century: poetry, fiction, and essays. 3 units. *Rolleston*

214S. The Twentieth Century. Literature of the twentieth century presented through representative authors. 3 units. *Rolleston*

215S. Seventeenth-Century Literature. Leading writers of the baroque, viewed against the background of their time. (Also listed under Medieval and Renaissance Studies.) 3 units. *Borchardt*

216. History of the German Language. Development of the phonology, morphology, and syntax of German from the beginnings to the present. (Also listed under Medieval and Renaissance Studies.) 3 units. *Rosenberg*

217S. Renaissance and Reformation Literature. The period from 1400 to about 1600. (Also listed under Medieval and Renaissance Studies.) 3 units. *Borchardt*

218S. The Teaching of German. A survey of modern teaching techniques: problems in the teaching of German on the secondary and college levels. Analysis and evaluation of textbooks and related audiovisual materials. 3 units. *Phelps*

219. Applied Linguistics. The application of modern linguistic principles to a systematic study of the phonetics, morphology, and syntax of modern German. Prerequisite: consent of instructor. 3 units. *Rosenberg*

230S. Lyric Poetry. Studies in poetry and poetic theory. From Goethe and the romantics to Rilke, Benn, and contemporary authors. 3 units. *Rolleston*

COURSES CURRENTLY UNSCHEDULED

301. Gothic

321, 322. Germanic Seminar

Health Administration

Professor Cooney, *Chairman and Director of Graduate Studies* (156 Trent Drive Hall); Professors Estes, Jaeger, and Warren; Associate Professors Falcone, Swanson, and Warner; Assistant Professor Smith; Adjunct Professors Kaluzny, Stull, and Toomey; Adjunct Assistant Professor Winfree; Associate Henderson-James

The Department of Health Administration offers graduate work leading to the M.H.A. degree. The graduate program is offered through two academic years and leads principally toward a career in the corporate management of complex health delivery organizations. Students without previous administrative experience in the health field are encouraged to apply for a twelve-month administrative fellowship following graduation. Admission to the program is based upon the capability for graduate study and demonstrated leadership potential of the candidate.

300. Introduction to Medical Care. An introduction to the major medical topics associated with health and illness. 3 units. *Estes*

301, 302. The Health System and Its Environment. A two-semester survey course covering the organization, management, staffing, and environment of American health services. The course utilizes a systems framework to describe interactions among the components that make up the health system. 3 units each. *Staff*

312. Comparative Health Systems. A comparative examination of the structure and performance of the health systems of the United States and other countries, particularly Canada and Great Britain. Topics include current financing, capitalization, utilization, control, and the relative roles of the governmental and private sectors. 3 units. *Falcone*

313. Quantitative Decision Making. A quantitative modeling framework to analyze management decisions in health administration provides the focus for the course. Areas of emphasis include the knowledge and skills needed to manage the analysis (i.e., formulation, assumptions, interpretation, cost of analysis) rather than on performing the analysis, stressing the process of analysis over details of technique. Decisions are analyzed both deterministically and stochastically, and on a scale from simple to complex. Techniques that serve the framework include calculus, inventory theory, PERT, decision analysis, fixed versus variable cost analysis, queuing, simulation, and mathematical programming. Examples from the field are used extensively. The latter part of the course presents the concepts of quantitative control, with the same emphasis and again with examples from the field. 3 units. *Warner*

321. Organizational Behavior in Health Systems. Introductory survey of behavioral science concepts and methods applied to the study and management of human behavior in health and human service organizations. Focus is on the manager's role in prevention and remediation of structural and behavioral

dysfunctions with staff, clients, and other organizations. Managerial, diagnostic, and problem-solving skills are developed from a critical appreciation of (1) strengths and weaknesses in organizational behavior theory, and (2) unique problems of application in health systems. 3 units. *Staff*

322. Design of Health Service Organizations. Organizational design concepts, assessment methodologies and intervention concepts are applied to various types of health service organizations. The course provides an analytical basis for comparing structure and process characteristics of various types of health service organizations as well as understanding various design problems and issues associated with their administration. 3 units. *Kaluzny*

326. Health Economics. A study of the economics of health and medical care. Attention is given to the unique problems of demand and supply in the health services sector, as well as the implications of private and public financing, restrictions on personnel entry, incentives and mobility, and problems of productivity measurement and changes. 3 units. *Staff*

331. Planning Health Services: Systems Planning. This course focuses on planning for the delivery of health services at the systems level (regional, community). Emphasis is on the dynamics of the planning process, policy and values, and analytical measurement and evaluation techniques. 3 units. *Henderson-James*

332. Institutional and Facilities Planning. A basic course in the practice of institutional planning with emphasis on the total process of conceiving, planning, and constructing health care facilities. The course is more practical than theoretical in orientation. Primary emphasis is on the hospital, yet principles and methodology relate to other health care organizations. 3 units. *Swanson*

333. Financial Management for Health Organizations. Application of the principles of financial and managerial accounting to the health environment. Discussion of influences of reimbursement, mechanisms of rate setting, applications of budgeting principles, and working capital management. 3 units. *Staff*

340. Social Dimensions of Illness. Introduction to basic principles of epidemiology; discussion of major health problems as they affect individuals, families, populations, and the health system; and consideration of the applications of epidemiological concepts to the evaluation and planning of health organizations and systems. 3 units. *Cooney and Smith*

344. Personnel Management. Surveys the advisory, service, stabilization, audit, and change functions of human resource activities from the perspective of the line manager. 3 units. *Staff*

345. Public Policy and Health Care. A study of the development and present status of selected public policy issues within their social, economic, and political contexts. Alternative courses of possible public action are reviewed and their probable outcomes are assessed. 3 units. *Falcone*

348. Legal Considerations in Health Administration. Introduction to law and the legal process as it relates to health administration, emphasizing the contribution that law makes to ethical and effective management practices. Topics include the constitutional basis for government support of health care services, constraints that law and regulations impose on the health care industry, public accountability, liability of health care providers, rights of patients, and administrative and business law for health care organizations. Students will prepare legal-type memoranda and participate in a mock trial or a demonstration of an administrative hearing. 3 units. *Warren*

350. Practicum in Health Services Administration. This course provides the student with the opportunity of working in administration in an institutional

setting. The student, while observing the day-to-day routine problems of managing a health service institution, is responsible for a set of tasks, assignments, and projects necessary to the functioning of the institution. A weekly session with faculty integrates this work experience and the student's academic training. 7 units. *Staff*

352. Ambulatory Health Services. This course covers the components of the organization and provision of personal health services in the ambulatory setting. Emphasis is on medical group management, including forms of organization, financing of services, physician-patient relationships, medical records, and peer review. 3 units. *Jaeger*

360. Current Topics in Health Administration. Examination of an important emerging topic in the field of health administration or in a closely related field. 3 units. *Staff*

361, 362. Case Studies in Health Administration. An integrating course sequence consisting of analyses of cases taken from institutional and programmatic health service settings. 3 units each. *Smith*

363. Health Administration Game. Designed around a sophisticated computer game, this course examines administrative planning and decision making in a simulated market for health services where part of the market is competitive and part is cooperative. Students assume roles as hospital administrators, health planning agency decision makers, and third party players. The game translates decisions from these players into simulated results, and prepares reports from which future decisions can be made. 3 units. *Warner*

367. Multi-Institutional Arrangements. A review of the history of various hospital systems and organizational arrangements. Discussion and study of the organizational structure, capital financing, and operational strategies. 3 units. *Toomey*

371, 372. Directed Research. Individual studies by arrangement. 3 units each. *Staff*

373. Current Legal Problems in Health Administration. This course follows up Health Administration 348 by providing an examination of selected current problems in health administration which are substantially affected by law and regulations. It is designed to acquaint students with the identification of legal problems in practical situations and to recognize legal alternatives. Topics may include union activities, relations with the media, liability coverage mechanisms, governing board and medical staff responsibilities, professional and vendor contracts, tax problems, and disputes between providers and government agencies—emphasizing the proper roles of attorney and administrator in each situation. Students will prepare legal-style memoranda and present "briefings" on the legal aspects of chosen topics. 3 units. *Warren*

377. Research Design and Data Analysis. Assumes Management Sciences 311 or equivalent, although some intermediate statistics will be reviewed. Covers multivariate techniques, scaling, factor analysis, and causal modeling. 3 units. *Falcone*

383. Program Development, Monitoring, and Evaluation. A review of methods used to construct local and national health service programs and associated grants development. The focus is on techniques of monitoring and evaluating problems found in program implementation and will identify principles used in their solution. Students will be required to demonstrate appropriate skills of synthesis, evaluation, and expression in response to case study material. 3 units. *Staff*

387. Information Systems. Technical and functional aspects of computerized hospital information systems from a management perspective, with emphasis on fundamentals of hardware and software, applications and system alternatives. 3 units. *Winfree*

388. Technology. Administrative implications of changes in technology anticipated in the next five to ten years. For this course, the term technology includes current medical and nonmedical developments (creating life forms, energy programs, population changes, new managerial techniques, laws and regulations). 3 units. *Henderson-James*

389. Corporate Planning for Health Services Organizations. Readings and cases on the purpose, process of determination, and evaluation of corporate objectives and strategies in a dynamic environment. 3 units. *Jaeger*

Management Sciences Courses for Students in Health Administration

300. Managerial Economics. Introduction to the economic theory of organizations and models for resource allocation in an organization. Also provides an understanding of how alternative market structures affect resource allocation decisions made by organizations. 3 units. *Staff*

310. Quantitative Methods. Mathematics for optimization with and without constraints in linear and nonlinear systems, and an introduction to probability theory. Topics related to optimization include partial derivatives, Lagrange multipliers, Kuhn-Tucker conditions, and linear programming. Those related to probability theory include sample spaces, events probability axioms, random variables, distributions, the Chebychev inequality and the central limit theorem. 4 units. *Staff*

311. Statistical Analysis for Management Decisions. Concepts and models of probability and techniques of classical statistics: sampling, estimation, hypothesis testing, and regression. 4 units. *Staff*

330. Financial Accounting. Information requirements imposed on the organization by agencies in its environment; activities of the firm within the framework of a financial accounting system designed to satisfy these information requirements. Emphasis is given to the study of financial accounting reporting and measurement problems from a theoretical and an applied basis, using cases and topical problems in financial accounting as a foundation for the learning experience. 4 units. *Staff*

331. Managerial Accounting. Establishes the relationships between the strategies of the organization as reflected in its planning activities and the impact of those plans on the data gathering, reporting activities, and operations inside the organization. Specific topics include budgeting, standard costing, control in a programmed environment, capital budgeting, and funds analysis. 4 units. *Staff*

333. Controllership. Accounting concepts as they apply to the planning and control aspects of health care institutions. Fund accounting, cost reimbursement, budgeting, internal control systems, and cost-benefit analysis are analyzed for application to health care institutions. The objective is to develop a framework in which the students can use managerial accounting data to analyze the financial consequences of real world health care problems. Prerequisites: Management Sciences 330 and 331. 3 units. *Staff*

351. Financial Management. The focus of the course is financial decision making in a nonprofit health care institution. Topics include security valuation and portfolio theory, capital budgeting and the cost of capital issue, long-term financing and leasing, short-term financing, and the management of current assets. 3 units. *Staff*

COURSES CURRENTLY UNSCHEDULED

351. Institutional Health Services

353. Community Health Services

History

Professor A. Scott, *Chairman* (235 Allen); Professor Lerner, *Director of Graduate Studies* (237 Allen); Professors Cahow, Cell, Chafe, Colton, Davis, Durden, Ferguson, Franklin, Holley, Mauskopf, Oates, Richards, W. Scott, TePaske, Watson, Witt, and Young; Associate Professors Bergquist, Crellin, Dirlik, Gavins, Goodwyn, Miller, Nathans, Roland, and Wood; Assistant Professors English, Huber, Kuhnholm, and Reddy

The Department of History offers graduate work leading to the A.M. and Ph.D. degrees. Candidates for the A.M. degree must have a reading knowledge of at least one ancient or modern foreign language related to their programs of study and have completed successfully a substantial research paper, normally the product of a year's seminar or two semester courses. The paper must be approved by two readers—the supervising professor and a second professor from the graduate staff. Students anticipating a May degree must have their papers read and approved by April 15; those anticipating a September degree must have their papers read and approved by August 1.

Candidates for the degree of Doctor of Philosophy are required to prepare themselves for examinations in four fields. Three usually shall be history. The choice of fields is determined in consultation with the student's supervisor and the Director of Graduate Studies. The department offers graduate instruction in the fields of Africa, Afro-American history, ancient history, medieval and early modern Europe, modern Europe, American history, Britain and the Commonwealth, Imperial Russia, Soviet Russia, Latin America, South Asia, modern China, modern Japan, military history, history of science, and history of medicine. The candidate for the Ph.D. degree usually must have a reading knowledge of two foreign languages, but in certain cases where the candidate's supervisor and the Director of Graduate Studies approve, and where the candidate's research for the dissertation would appreciably benefit, an alternative to the second language may be accepted. This alternative usually would take the form of successfully completed formal training in an auxiliary discipline (such as statistics or a course in one of the other social sciences with an emphasis upon methodology) of 3 to 6 units, or the equivalent, depending on the student's program. It also must be in addition to any previous undergraduate work in the discipline. The requirement, whether satisfied by two languages or by one language and an alternative, must be met prior to the preliminary examination.

Ancient History. For courses in ancient history which may be taken for credit in either history or classical studies, see Classical Studies.

For Seniors and Graduates

Students may receive credit for either semester of a hyphenated course at the 200 level without taking the other semester if they obtain written consent from the instructor.

201S. Aspects of Change in Prerevolutionary Russia. Origin and dynamics of the Russian revolutionary movement, the intelligentsia, and the emergence of the labor movement. 3 units. *Miller*

202S. Russian Anarchism: Theory and Practice. 3 units. *Miller*

205S. Progressive Era in the United States and World War I. 3 units. *Watson*

206S. The Nineteen-Twenties and the New Deal in the United States. 3 units. *Watson*

212. Recent Interpretations of United States History. A course designed to encourage a critical evaluation of important issues in United States history through examination of recent interpretations. This course meets for three-hour meetings twice each week and ends at midsemester. 3 units. *Watson and staff*

213. Medicine and Society in America. Emergence of modern medical science, patterns and options for medical care, and health-related ethical issues considered in historical and contemporary American background. 3 units. *Staff*

215-216. The Diplomatic History of the United States. (Not open to undergraduates who have had History 121-122.) 6 units. *Davis*

219S, 220S. History of Science and Technology. The interaction of science and technology in the Western world from earliest times to the present. 3 units each. *Mauskopf and Roland*

221. Problems in the Economic and Social History of Europe, 1200-1700. (Also listed under Medieval and Renaissance Studies.) 3 units. *Witt*

224S. Seminar in Legal History. A study of the history of American law during a defined chronological period. (Also listed as Law 410.) 3 units. *Pratt*

225. American Legal History. A study of the development of fundamental legal institutions, with emphasis upon the relationships between the changes in the law and other changes in American life. (Also listed as Law 415.) 3 units. *Pratt*

226S. Seminar in Legal Biography. Biography as a form of legal history, the problems inherent in writing biography, the goals of an author of legal biography, and the constraints that may be placed on an author. (Also listed as Law 526.) 3 units. *Pratt*

227-228. Recent United States History: Major Political and Social Movements. 6 units. *Chafe*

231S, 232S. Problems in the History of Spain and the Spanish Empire. 3 units each. *TePaske*

234S. Political Economy of Development: Theories of Change in the Third World. See course description for Political Science 234S. (Also listed as Anthropology 234S and Sociology 234S.) 3 units. *Bergquist, Gereffi, Smith, and Valenzuela*

235. The Antebellum South. The economic, political, and social aspects of life in the South, 1820-1860. 3 units. *Franklin*

236. The Reconstruction Era. The historiography of the Reconstruction and the problems of adjustment in the South in the postwar years. 3 units. *Franklin*

237S. Europe in the Early Middle Ages. (Also listed under Medieval and Renaissance Studies.) 3 units. *Young*

238S. Europe in the High Middle Ages. (Also listed under Medieval and Renaissance Studies.) 3 units. *Young*

239. History of Socialism and Communism. Origins and development of socialist and communist movements. 3 units. *Lerner*

243-244. Marxism and History. 3 units each. *Dirlik*

247. History of Modern India and Pakistan, 1707-1857. Analysis and interpretation, with special emphasis on social and economic change. 3 units. *Richards*

248. History of Modern India and Pakistan, 1857 to the Present. 3 units.
Richards

249-250. Social and Intellectual History of the United States. The interplay of ideas and social practice through the examination of attitudes and institutions in such fields as science and technology, law, learning, and religion. 6 units.
Holley

253S, 254S. Foreign Relations of the European Powers, 1871-1945. Origins of the First and Second World Wars, the diplomacy of the wars, and the peace settlements which followed them. 3 units each. *W. Scott*

260S. Economic History of Japan. (Also listed as Economics 232S.) 3 units.
Bronfenbrenner

261-262. Problems in Soviet History. Studies in the background of the Revolution of 1917 and the history and politics of the Soviet state. 6 units.
Lerner

265S. Problems in Modern Latin-American History. 3 units. *Bergquist*

267S-268S. From Medieval to Early Modern England. The intellectual, social, and political problems of transition to modern England, with special emphasis on the English Renaissance. (Also listed under Medieval and Renaissance Studies.) 6 units. *Ferguson*

269S-270S. British History, Seventeenth Century to the Present. Historiography of social structure and social change: English Revolution, party, the Industrial Revolution, class and class consciousness, Victorianism, and the impact of war in the twentieth century. 6 units. *Cell*

273S, 274S. Topics in the History of Science. Critical stages in the evolution of scientific thought. 3 units each. *Mauskopf*

277S. The Coming of the Civil War in the United States, 1820-1861. 3 units. *Durden*

278S. The Civil War in the United States and Its Aftermath, 1861-1900. 3 units. *Durden*

282S. Canada. Topics vary each semester and may include nationalism in Canada, Canadian defense policies, Canadian-American relations, regionalism in Canada, or others. (Also listed as Anthropology 282S, Economics 282S, Political Science 282S, and Sociology 282S.) 3 units. *Leach and visitors*

285S, 286S. Oral History. Research on race relations and civil rights in the United States in the twentieth century using techniques of oral history. 3 units each. *Chafe and Goodwyn*

Seminars for Graduates

301-302. Research Seminar in History. Required of all entering first-year graduate students in history. 6 units. *Staff*

307-308. Seminar in United States History. 6 units. *American history staff*

371-372. Research Seminars. To be taken either in conjunction with colloquia listed below or by special arrangement with graduate instructors. When research seminars are not offered, independent research in a desired area may be worked out with the Director of Graduate Studies and the appropriate graduate instructor. These seminars do not appear on the official schedule of courses.

Colloquia for Graduates

351-352. Colloquia. Each colloquium deals with an aspect of history by means of readings, oral and written reports, and discussion, with attention to

bibliography. Ad hoc colloquia may be worked out during registration in the various fields represented by members of the graduate faculty; these colloquia do not appear on the official schedule of courses. In some instances, students may take the equivalent of a research seminar in conjunction with the colloquium and will be credited with an additional 6 units by registering for 371.1-372.1, etc.

Historiography and the Teaching of History—For Graduates

312. Seminar in the Teaching of History in College. The work in this course is intended to acquaint students with the problems involved in teaching history in college. Required of all candidates for the degree of Doctor of Philosophy who are in residence for two years at Duke. As an alternate method of meeting this requirement, a graduate student may, in cooperation with a member of the faculty, serve a one-semester teaching apprenticeship. No credit. Supervised by Director of Graduate Studies.

314. Historical and Social Science Methodology. Methods used in historical research with emphasis upon the various social science approaches. 3 units.
Staff

History 314 is required of all candidates for the Ph.D. degree who are in residence for two years at Duke University.

392. Tutorial in Journal Editing. (Also listed as English 392.) 3 units, ungraded. *Watson or Ferguson (English)*

Independent Study

399. Supervised independent study and reading, with consent of professor. 3 units.

COURSES CURRENTLY UNSCHEDULED

204. The Uses of History in Public Policy: II

207S, 208S. The Development of Urban America

209S, 210S. Topics in Afro-American History, 1619-Present

218S. Twentieth-Century Europe: Social and Economic Issues

222. Problems in European Intellectual History, 1250-1550

255S-256S. Problems in African History

287S, 288S. History of Japan

297S. The British Empire of the Nineteenth Century

298S. The Commonwealth in the Twentieth Century

317, 318. Seminar in the History of Western Europe

401. Seminar on the British Commonwealth

Humanities—The Master of Arts Program

Professor Burian, *Director* (classical studies)

The Master of Arts Program in Humanities is an interdepartmental program and is tailored to the needs of individual students. The candidate defines a theme and selects appropriate course work with the aid and approval of a supervising committee. Thirty units of course work are required for completion of the program. There is no thesis requirement, but the candidate submits at least two substantial papers arising from course work for review by committee members,

and meets with them to discuss his or her program in a final master's colloquium. A noncredit introductory seminar, *Humanities as Ways of Knowing*, will be offered to all participants in the program.

The program is open to holders of undergraduate degrees in any discipline who can demonstrate sufficient background in humanities to permit study at the graduate level. Admission is by regular application to the Graduate School. Students may enroll full-time or part-time (minimum of 6 units per term). Students considering entering the program may enroll in an appropriate graduate course or courses through the Office of Continuing Education, at the same time making their interest known to the Director of the humanities program.

Literature—The Ph.D. Program

Associate Professor Rolleston, *Chairman and Director of Graduate Studies* (105 Languages); Professors Duffey (English), Krynski (Slavic languages), Newton (classical studies), Ryals (English), Stewart (French), Tetel (French), Wardropper (Spanish), and Williams (English); Associate Professors Borchardt (German), Burian (classical studies), Caserta (Italian), DeNeef (English), Garci-Gómez (Spanish), Orr (French), and Thomas (French); Assistant Professor Pérez (Spanish)

The interdepartmental program leading to a Ph.D. in literature offers to qualified students the opportunity to develop individual course sequences combining a series of core courses with selected courses in one or more of the departments of national literatures. Students entering the program must present evidence of ability to read two languages other than English, modern or classical; students commanding only one foreign language will learn a second during the first year of graduate study. The two-year program of courses includes a tutorial requirement: at least three courses must be taken on a tutorial basis, so that the student can rapidly acquire both specific research skills and broad perspectives on questions of literary theory and methodology.

Students' programs will be structured in consultation with the Committee for the Ph.D. in Literature. This committee, drawn from several literature departments, directs the program and advises students at every stage. More information on the program is provided in the "Special and Cooperative Programs" chapter of this bulletin; and a full descriptive brochure is available from Professor Rolleston, the Director of Graduate Studies.

301. Introduction to the Graduate Study of Literature. History and theory of concepts central to literary studies: genre, period, reference and self-reference, style, influence, literary studies as institution. 3 units. *Pérez and staff*

302. Criticism and Literary Theory in the Twentieth Century. Introduction to critical philosophies, movements, and strategies informing current theory: formalism, new criticism, phenomenology, structuralism, psychoanalysis, semiology, deconstruction, feminism. 3 units. *Stewart, Orr, Rolleston, Thomas, and staff*

303. Special Topics in Structure, Genre, and Periodization. 3 units. *Staff*

304. Philology, Linguistics, and the Roots of Literature. A survey of the various ways in which language and literature interact, with an introduction to philology and historical linguistics. 3 units. *Thomas and staff*

Marine Sciences—The University Program

Professor Costlow, *Director* (zoology); Associate Professor Ramus, *Assistant Director for Academic Programs* and *Director of Graduate Student Affairs* (botany); Professors Barber

(botany and zoology), Gutknecht (physiology), Pilkey (geology), and White* (botany); Associate Professors Forward (zoology), McClay* (zoology), Rosendahl* (geology), Searles* (botany), Sullivan (biochemistry), and Sutherland (zoology); Professor Emeritus Bookhout (zoology); Assistant Medical Research Professors C. Bonaventura (biochemistry) and J. Bonaventura (biochemistry)

Graduate students from any and all academic disciplines are encouraged to take professional training at the Marine Laboratory. The program operates year-round, providing course work in the marine sciences, an active seminar program, and facilities supporting dissertation research. Presently, resident graduate students number fifteen and represent the Departments of Biochemistry, Botany, Physiology, and Zoology. Ordinarily, dissertation advisers are resident as well, although this need not be the case. The Marine Laboratory has available five full-time teaching assistantships for graduate student support. In addition, tuition credits obtained from fellowship support may be applied to courses given both at the Marine Laboratory and the Durham campus.

Persons interested in graduate work in marine sciences should apply through one of the appropriate departments. Forms may be obtained from the Graduate School.

Applications for summer courses at the laboratory should be addressed to the Admissions Office, Duke University Marine Laboratory, Beaufort, North Carolina 28516. The form may be obtained from the *Bulletin of Duke University: Marine Laboratory*. The application for enrollment in the Duke University summer session should be accompanied by transcripts of undergraduate and graduate work. Applications should be received as early as possible. Graduate students planning to enroll in courses or seminars offered during the fall or spring at the Marine Laboratory should notify the Admissions Office of the Marine Laboratory of such intent *prior* to the beginning of the respective term.

Students registering for research should do so under the appropriate departmental numbers.

The following courses are offered at Beaufort. See the Marine Laboratory bulletin for the current schedule of courses.

SUMMER PROGRAM AT BEAUFORT

For Seniors and Graduates

203L. Marine Ecology. Application of ecological theory to marine systems. Mathematical properties of population growth and species interactions; field and laboratory projects with computer-assisted analysis of data. Practice in scientific writing. Readings from current scientific publications. Prerequisites: introductory biology or invertebrate zoology and calculus; knowledge of statistics recommended. (Also listed as Zoology 203L.) 6 units. *Sutherland*

205. Geological Oceanography. (Also listed as Geology 205.) 6 units. *Pilkey*

215L. Primary Productivity in the Seas. The biological flux of carbon in the coastal and open seas involving phytoplankton, seaweeds, seagrasses, and marsh-grasses. The contributions of these primary producers to food chain processes and global atmospheric-sedimentary cycles, as well as the ecological consequences of variations in photosynthetic mechanisms. Prerequisites: introductory biology and introductory chemistry. (Also listed as Botany 215L and Zoology 215L.) 4 units. *Barber and Ramus*

218. Barrier Island Ecology. Adaptation of plants to barrier island migration and other physical characteristics of the coastal environment. Major emphasis will

*In residence during summer only.

be placed on management of barrier beaches from Maine to Texas and the impact of human interference with natural processes. Field studies. Prerequisite: course in general ecology. (Also listed as Botany 218 and Forestry and Environmental Studies 218.) 6 units. *Staff*

219L. Benthic Marine Algae. Morphology, reproduction, life histories, systematics, and natural history of seaweeds. Lectures, laboratories, and fieldwork in ocean and estuaries. Prerequisite: introductory biology; plant diversity recommended. (Also listed as Botany 219L.) 4 units. *Searles*

244L. Diversity of Plants. Surveys major groups of living plants with emphasis on algae, bryophytes, and vascular plants. Field observations and collections stress coastal botany and provide a basis for independent projects. Not open to students who have had Botany 245L. Prerequisite: introductory biology. (Also listed as Botany 244L.) 6 units. *White*

247L. Plant Ecology. Principles of the relationships between plants and their environments. Emphasis on structures and processes of coastal plain ecosystems. Not open to students who have had Botany 246L. Prerequisite: introductory biology. (Also listed as Botany 247L.) 6 units. *Staff*

250L. Physiology of Marine Animals. Environmental factors, biological rhythms, and behavioral adaptations in the comparative physiology of marine animals. Prerequisites: introductory biology and chemistry. (Also listed as Zoology 250L.) 4 units. *Forward*

263L. Tropical Seaweeds. Collection, preservation, description, identification, illustration, and descriptive ecology. Two-week field study on Andros Island in the Bahamas. Prerequisite: Botany 145L or equivalent or consent of instructor. (Also listed as Botany 263L.) 2 units. *Searles*

274L. Marine Invertebrate Zoology. Structures, functions, and habits of invertebrate animals under natural and experimental conditions. Field trips included. Not open to undergraduate students who have had Zoology 175 except with consent of Director of Undergraduate Studies. Prerequisite: introductory biology. (Also listed as Zoology 274L.) 6 units. *Staff*

276. Comparative and Evolutionary Biochemistry. Lectures and discussion of the origin of life, evolution of the genetic code, mutation and protein polymorphism, natural selection and protein structure, and comparison of homologous proteins and nucleic acids. Laboratory work involves the purification and characterization of homologous proteins from fish and invertebrates. Techniques include salt fractionation, electrophoresis, ion-exchange and molecular exclusion chromatography, fingerprinting, molecular weight determination, amino acid composition, and other related approaches. Prerequisite: consent of instructor. (Also listed as Biochemistry 276.) 6 units. *Sullivan*

278L. Invertebrate Developmental Biology. Gametogenesis, fertilization, and development of invertebrates, with emphasis on experimental studies of prelarval stages. Prerequisite: consent of instructor. (Also listed as Zoology 278L.) 6 units. *McClay and visiting staff*

353, 354. Research. Hours to be arranged. Prior approval of instructor at the Duke University Marine Laboratory is required. For graduate students only. (Also listed as Zoology 353, 354.) *Staff*

359, 360. Research. Hours to be arranged. Prior approval of instructor at the Duke University Marine Laboratory is required. For graduate students only. (Also listed as Botany 359, 360.) *Staff*

FALL PROGRAM AT BEAUFORT

For Juniors, Seniors, and Graduates

209. Independent Study. A tutorial designed for students who are interested in either a laboratory or a library project in biochemistry. (Also listed as Biochemistry 209-210.) Credit to be arranged. *Staff*

245L. Macromolecules, Ecology, and Evolution. The structure and function of protein and nucleic acid molecules with particular emphasis on the application of molecular techniques to questions in ecological, systematic, and evolutionary theory. (Also listed as Biochemistry 245L.) 3 units. *Sullivan*

Seminar. Special topics in the marine sciences. Exploration at the advanced level of current research in the marine sciences. Subject dependent on faculty and student interests. (Also listed as Botany 295S, Physiology 219S, and Zoology 295S.) 2 units. *Staff*

SPRING PROGRAM AT BEAUFORT

For Juniors, Seniors, and Graduates

210. Independent Study. A tutorial designed for students who are interested in either a laboratory or a library project in biochemistry. (Also listed as Biochemistry 209-210.) Credit to be arranged. *Staff*

Seminar. Special topics in the marine sciences. Exploration at the advanced level of current research in the marine sciences. Subject dependent on faculty and student interest. (Also listed as Biochemistry 220S, 265S, 266S; Botany 295S, 296S; and Zoology 295S, 296S.) 2 units. *Staff*

COURSES CURRENTLY UNSCHEDULED

204L. Marine Microbiology

220L. Adaptations of Organisms to the Marine Environment

250. Introduction to Marine Geophysics

293. Ecological Basis for Coastal Area Planning and Management

Mathematics

Professor Reed, *Chairman* (215 Physics); Professor Allard, *Director of Graduate Studies* (211B Physics); Professors DiPerna, Schaeffer, Shoenfield, Warner, and Weisfeld; Associate Professors Burdick, Hodel, Kitchen, Kraines, Moore, Pardon, Schonbek, Scoville, and Smith; Assistant Professors Flath, Lawler, Schoen, Shearer, Sylvester, Wolpert, and Wright; Adjunct Professors Bernstein and Chandra

Graduate work in the Department of Mathematics is offered leading to the M.S., A.M., and Ph.D. degrees. Admission to these programs is based on the applicant's undergraduate academic record, level of preparation for graduate study, the Graduate Record Examination, and letters of recommendation.

All A.M. and Ph.D. candidates are required to pass a qualifying examination after completing their first year of graduate study. The A.M. degree with a major in mathematics is awarded upon completion of 30 units of graded course work and passing the qualifying examination. A thesis may be substituted for 6 units of course work only under special circumstances. The department also offers a program in applied statistics with a minor in computer science leading to the M.S. degree.

Candidacy for the Ph.D. is established by passing the qualifying examination at the Ph.D. level, completing the department's language requirements, and

passing an oral preliminary examination. The preliminary examination is normally taken at the beginning of the third year. The preliminary examination is conducted by a committee selected by the rules of the Graduate School and the department. The examination can, at the student's option, consist of either questions based on the student's course work at Duke or on the specific area of research plus a minor subject selected by the student.

After admission to candidacy, the Ph.D. degree is awarded on the basis of the student's scholarly ability as demonstrated by the dissertation and its defense. The dissertation is the most important requirement in the award of the Ph.D. degree.

For Seniors and Graduates

200. Introduction to Algebraic Structures I. Laws of composition, groups, rings; isomorphism theorems; axiomatic treatment of natural numbers; polynomial rings; division and Euclidean algorithms. Prerequisite: Mathematics 104 or equivalent. 3 units. *Staff*

201. Introduction to Algebraic Structures II. Vector spaces, matrices and linear transformations, fields, extensions of fields, construction of real numbers. Prerequisite: Mathematics 200 or equivalent. 3 units. *Staff*

203. Basic Analysis I. Topology of R^n , continuous functions, uniform convergence, compactness, infinite series, theory of differentiation, and integration. Not open to students who have had Mathematics 139. Prerequisite: Mathematics 104. 3 units. *Staff*

204. Basic Analysis II. Inverse and implicit function theorems, differential forms, integrals on surfaces, Stokes' theorem. Not open to students who have had Mathematics 140. Prerequisite: Mathematics 203. 3 units. *Staff*

205. Topology. Elementary topology, surfaces, covering spaces, Euler characteristic, fundamental group, homology theory, exact sequences. Prerequisite: Mathematics 104. 3 units. *Staff*

206. Differential Geometry. Geometry of curves and surfaces, the Serret-Frenet frame of a space curve, the Gauss curvature, Cadazzi-Mainardi equations, the Gauss-Bonnet formula. Prerequisite: Mathematics 104. 3 units. *Staff*

221, 222. Numerical Analysis I, II. (Also listed as Computer Science 221, 222.) 3 units each. *Gallie, Patrick, or Utku*

230. Mathematical Methods in Physics and Engineering I. Heat and wave equations, initial and boundary value problems, Fourier series, Fourier transforms, potential theory. Not open to students who have had Mathematics 114. Prerequisites: Mathematics 103 and 104 or equivalents. 3 units. *Staff*

231. Mathematical Methods in Physics and Engineering II. Green's functions, propagators, integral equations, spectral theory on Hilbert space, Fredholm alternative, variational methods. Prerequisite: Mathematics 114 or Mathematics 230. 3 units. *Staff*

234. Mathematics for Quantum Mechanics. Hilbert space, self-adjoint operators, the mathematical model of quantum mechanics, commutation relations, spectral analysis of Hamiltonians, time dependent scattering theory. Prerequisites: Mathematics 230 and 231 or equivalents. 3 units. *Staff*

235. Topics in Mathematical Physics. Group representations, perturbation theory, quantum field theory, statistical mechanics, or general relativity. Prerequisite: Mathematics 231 or equivalent. 3 units. *Staff*

238, 239. Topics in Applied Mathematics. Conceptual basis of applied mathematics, combinatorics, graph theory, game theory, mathematical pro-

gramming, or numerical solution of ordinary and partial differential equations. Prerequisites: Mathematics 103 and 104 or equivalents. 6 units. *Staff*

240. Applied Stochastic Processes. Applications of probability theory and stochastic processes to economics and environmental science. Markoff chains, optional stopping, queuing theory, decision theory, birth and death processes, and the Monte-Carlo method. Prerequisite: Mathematics 135 or equivalent. 3 units. *Staff*

241. Linear Models. Geometric interpretation, multiple regression, analysis of variance, experimental design, analysis of covariance. Prerequisite: Mathematics 136 or equivalent. 3 units. *Staff*

242. Multivariate Statistics. Multinormal distributions, multivariate general linear model, Hotelling's T^2 statistic, Roy union-intersection principle, principal components, canonical analysis, factor analysis. Prerequisite: Mathematics 241 or equivalent. 3 units. *Staff*

248, 249. Topics in Statistics. Analysis of variance, design of experiments, nonparametric statistics, foundations of statistical inference. Prerequisite: consent of instructor. 6 units. *Staff*

250. Introductory Mathematical Logic. First-order logic, completeness theorem, compactness theorem, introduction to recursive functions, incompleteness theorem. Prerequisite: Mathematics 187 or Mathematics 200 or equivalent. 3 units. *Staff*

251. Set Theory I. Zermelo-Fraenkel axioms, ordinals and cardinals, models of set theory, constructible sets. Prerequisite: Mathematics 187 or Mathematics 200 or equivalent. 3 units. *Staff*

258, 259. Topics in Logic. Model theory, recursion theory, set theory, or other fields of logic. Prerequisite: Mathematics 250 or equivalent. 6 units. *Staff*

260. Groups, Rings, Modules. Elementary categorical algebra, groups, rings, modules, linear and multilinear algebra. Prerequisite: Mathematics 201 or equivalent. 3 units. *Staff*

261. Commutative Algebra. Fields, Noetherian rings and modules, Dedekind domains. Prerequisite: Mathematics 260 or equivalent. 3 units. *Staff*

268, 269. Topics in Algebra. Algebraic number theory, algebraic K -theory, homological algebra, or topological algebra. Prerequisite: Mathematics 260. 6 units. *Staff*

271. Algebraic Topology. Fundamental group and covering spaces, homology groups of cell complexes, classification of compact surfaces, the cohomology ring, and Poincaré duality for manifolds. Prerequisites: Mathematics 171S and 200 or equivalents. 3 units. *Staff*

278, 279. Topics in Topology. Point set, algebraic, geometric, or differential topology. Prerequisite: consent of instructor. 6 units. *Staff*

280. Differential Analysis. Differential calculus, ordinary differential equations, flows, Lie bracket, total differential equations, first order partial differential equations, deRham theory. Prerequisite: Mathematics 140 or equivalent. 3 units. *Staff*

281. Real Analysis I. Measures, Lebesgue integral, L^p -spaces, Daniell integral, differentiation theory, product measures. Prerequisite: Mathematics 140 or equivalent. 3 units. *Staff*

282. Real Analysis II. Metric spaces, fixed point theorems, Baire category theorem, Banach spaces, fundamental theorems of functional analysis, Fourier transform. Prerequisite: Mathematics 281 or equivalent. 3 units. *Staff*

283. Linear Operators. Bounded and unbounded operators on Banach and Hilbert spaces, symmetric and self-adjoint operators, Banach algebras, spectral theorem, unitary groups, compact operators, Fredholm theory, accretive operators, semigroups of operators. Prerequisite: Mathematics 282 or equivalent. 3 units. *Staff*

285. Complex Analysis. Complex calculus, conformal mapping, Riemann mapping theorem, Riemann surfaces. Prerequisite: Mathematics 140 or equivalent. 3 units. *Staff*

286. Topics in Complex Analysis. Geometric function theory, function algebras, several complex variables, uniformization, or analytic number theory. Prerequisite: Mathematics 285 or equivalent. 3 units. *Staff*

288, 289. Topics in Analysis. Harmonic analysis, dynamical systems, geometric measure theory, or calculus of variations. Prerequisites: Mathematics 281 and 285 or equivalents. 6 units. *Staff*

290. Probability. Random variables, independence, expectations, laws of large numbers, central limit theorem, Markoff chains. Prerequisite: Mathematics 281 or equivalent. 3 units. *Staff*

297. Fourier Analysis and Distribution Theory. Tempered distributions, Fourier transforms, classical inequalities, oscillatory integrals. Prerequisites: Mathematics 140 and 285 or equivalents. 3 units. *Staff*

298. Partial Differential Equations I. Fundamental solutions of linear partial differential equations, hyperbolic equations, characteristics, Cauchy-Kovalevskaya theorem, propagation of singularities. Prerequisite: Mathematics 297 or equivalent. 3 units. *Staff*

387. Current Research in Mathematical Physics. 3 units. *Staff*

388, 389. Current Research in Analysis. 6 units. *Staff*

COURSES CURRENTLY UNSCHEDULED

252. Set Theory II

284. Topics in Functional Analysis

293, 294. Topics in Probability Theory

299. Partial Differential Equations II

358-359. Current Research in Logic

368-369. Current Research in Algebra

378-379. Current Research in Topology

Program in Medieval and Renaissance Studies

Professor Steinmetz, *Chairman* (101 Divinity); Associate Professor Goffen, *Director of Graduate Studies* (114B East Duke)

The graduate Program in Medieval and Renaissance Studies is an interdisciplinary program administered by the Duke University Center for Medieval and Renaissance Studies. In consultation with the Director of Graduate Studies, students in the program select courses in art, history, music, philosophy, religion, language and literature (classical studies, English, German, and Romance languages). The program is described in the chapter "Special and Cooperative Programs." For descriptions of the individual courses see the listings under the specified department.

DEPARTMENT OF ART

- 230S. Medieval and Byzantine Art and Architecture. *Bruzelius or Epstein*
- 232S. Romanesque and Gothic Art and Architecture. *Bruzelius*
- 240. Italian Art. *Goffen or Spencer*
- 242S. Studies in Italian Renaissance Art. *Goffen or Spencer*

DEPARTMENT OF CLASSICAL STUDIES

- 221. Medieval Latin. *Newton*
- 312. Proseminar in Latin Paleography. *Newton*

DEPARTMENT OF ENGLISH

- 207. Old English Language and Literature. *Nygard*
- 208. History of the English Language. *Nygard*
- 212. Middle English Literature: 1100 to 1500. *Nygard*
- 221. Renaissance Prose and Poetry: 1500 to 1660. *DeNeef, Randall, or G. Williams*
- 225. Renaissance Drama: 1500 to 1642. *Randall or G. Williams*
- 310. Studies in Old English Literature. *Nygard*
- 312. Studies in Middle English Literature. *Nygard*
- 315. Studies in Chaucer. *Nygard*
- 321. Studies in Renaissance Literature. *DeNeef, Randall, or G. Williams*
- 324. Studies in Shakespeare. *G. Williams or Porter*
- 329. Studies in Milton. *DeNeef*
- 380. Studies in Ballad and Folksong. *Nygard*
- 383. Textual Criticism. *G. Williams*

DEPARTMENT OF GERMANIC LANGUAGES AND LITERATURE

- 205, 206. Middle High German. *Borchardt*
- 215S. Seventeenth-Century Literature. *Borchardt*
- 216. History of the German Language. *Staff*
- 217S. Renaissance and Reformation Literature. *Borchardt*

DEPARTMENT OF HISTORY

- 221. Problems in the Economic and Social History of Europe, 1200–1700. *Witt*
- 222. Problems in European Intellectual History, 1250–1550. *Witt*
- 237S. Europe in the Early Middle Ages. *Young*
- 238S. Europe in the High Middle Ages. *Young*
- 267S–268S. From Medieval to Early Modern England. *Ferguson*

DEPARTMENT OF MUSIC

- 201. Bibliography. *Kirkendale*
- 211. Medieval Notation. *Herlinger*
- 212. Renaissance Notation. *Herlinger*
- 221. Monophonic Music. *Seebass*
- 222. Music in the Middle Ages: Polyphony. *Seebass*
- 223. Music in the Renaissance. *Kirkendale*
- 311S. Seminar in Medieval Music. *Staff*
- 312S. Seminar in Renaissance Music. *Staff*
- 351S. Studies in Musical Iconography. *Seebass*

DEPARTMENT OF PHILOSOPHY

- 218S. Medieval Philosophy. *Mahoney*
- 219S. Late Medieval and Renaissance Philosophy. *Mahoney*

DEPARTMENT OF RELIGION

- 219. Augustine. *Gregg*
- 236. Luther and the Reformation in Germany. *Steinmetz*
- 241. Problems in Reformation Theology. *Steinmetz*
- 334. Theology and Reform in the Later Middle Ages. *Steinmetz*
- 338. Calvin and the Reformed Tradition. *Steinmetz*
- 339. The Radical Reformation. *Steinmetz*

DEPARTMENT OF ROMANCE LANGUAGES

French

- 211. History of the French Language. *Hull*
- 240. Old French Literature. *Vincent*

248. French Literature of the Seventeenth Century. *Stewart*
 345. French Prose of the Sixteenth Century. *Tetel*
 346. Topics in Renaissance Poetry. *Tetel*
 391, 392. French Seminar (medieval and Renaissance topics). *Tetel and Vincent*

Italian

284. Dante. *Caserta*
 285. Dante. *Caserta*

Spanish

210. History of the Spanish Language. *Garci-Gómez*
 251. The Origins of Spanish Prose Fiction. *Wardropper*
 253. Cervantes. *Wardropper*
 254. Drama of the Golden Age. *Wardropper*
 258. Spanish Lyric Poetry before 1700. *Wardropper*
 391, 392. Hispanic Seminar (medieval and Renaissance topics). *Garci-Gómez and Wardropper*

COURSES CURRENTLY UNSCHEDULED

- Classical Studies 306. Latin Seminar VI
 Classical Studies 327. Seminar in Byzantine History
 English 210. Old English Literary Tradition
 History 221. Problems in the Economic and Social History of Europe, 1200-1700
 Religion 206. Christian Mysticism in the Middle Ages
 Religion 251. The Counter-Reformation and the Development of Catholic Dogma
 Religion 344. Zwingli and the Origins of Reformed Theology

Microbiology and Immunology

Professor Joklik, *Chairman* (414A Jones); Professor Willett, *Director of Graduate Studies* (420 Jones); Professors Amos, Bolognesi, R. Buckley, Burns, Day, Metzgar, Osterhout, Rosse, Scott, Seigler, Smith, Snyderman, Vanaman, Ward, and Wheat; Associate Professors Bastia, Collins, Corley, Cresswell, Dawson, Mitchell, and Sage; Assistant Professors Adams, C. E. Buckley III, Cambier, Endow, Keene, McClay, and Pisetsky; Associate Medical Research Professor Koren; Assistant Medical Research Professors Burdett, Hubbard, Miller, and Sedwick

The department offers graduate work leading to the Ph.D. degree. Specialization is possible in molecular virology, viral oncology, cell biology, tumor biology, molecular microbiology, molecular genetics, immunochemistry, immunogenetics, cancer immunology, general immunology, and medical mycology.

Undergraduate preparation in the biological and physical sciences and in biochemistry is required. A brochure describing the Ph.D. degree program, prerequisites for admission, and research in the department can be obtained by writing the Director of Graduate Studies, Box 3020, Duke University Medical Center, Durham, North Carolina 27710.

214. Fundamentals of Electron Microscopy. An introduction to the basics of electron microscopy, specimen preparation, and ultramicrotomy. Open only to graduate students in microbiology and immunology. 2 units. *Miller*

216. Experimental Immunochemistry. An intensive practical introduction to methods in immunology for the isolation of antigens and for the production and analysis of monospecific antisera and hybridomas. Open only to graduate students in microbiology and immunology. 2 units. *Cambier*

219. Molecular and Cellular Bases of Differentiation. See course description for Anatomy 219. (Also listed as Biochemistry 219, Pathology 219, and Physiology 230.) *Counce, McCarty, and staff*

219S. Seminar. Optional seminar offered in conjunction with Microbiology and Immunology 219.

221. Medical Microbiology. An intensive study of common bacteria, viruses, fungi, and parasites which cause disease in humans. The didactic portion of the course focuses on the nature and biological properties of micro-organisms causing disease, the manner of their multiplication, and their interaction with the entire host as well as specific organs and cells. 4 units. *Joklik and staff*

233. Principles of Microbiology and Immunology. Physiology and molecular biology of bacteria, the properties of bacterial and animal viruses, and basic immunology. Prerequisites: Chemistry 152 and Zoology 160 or Biochemistry 227. 3 units. *Burns, Dawson, Joklik, and Willett*

234. Introduction to Biostatistical Methods. Elementary statistical procedures having special application to biological research. Special emphasis on the interpretation of parameters and the appropriateness of assumptions in the biological/laboratory setting. Prerequisite: elementary mathematics including college algebra. 3 units. *Amos and Dawson*

236. Statistical Methods in Human Genetics. An introduction to statistical procedures for determining and predicting the inheritance of human characteristics through studies of families and of populations, including the testing of genetic hypotheses and the estimation of genetic parameters from human data. Prerequisite: introductory genetics. 3 units. *Amos and Dawson*

238. Intermediate Biostatistics and Data Analysis. A consideration of statistical methods having special application to biological research, including the analysis of variance, multiple regression, nonparametric statistics, and bioassay, as well as the use of statistical computer packages. Prerequisite: Microbiology and Immunology 234 or equivalent. 3 units. *Dawson*

244. Principles of Immunology. An introduction to the molecular and cellular basis of the immune response. Topics include the anatomy of the lymphoid system, lymphocyte biology, antigen-antibody interactions, humoral and cellular effector mechanisms, and control of immune responses. Prerequisites: Zoology 160 and Chemistry 152. (Also listed as Zoology 244.) 3 units. *Hubbard and Whisnant*

252. General Virology and Viral Oncology. The first half will be a discussion of the structure and replication of mammalian and bacterial viruses with special emphasis on the molecular and functional aspects. A second part will deal specifically with tumor viruses, discussed in terms of the virus-cell interaction and the response to the host. The relationship of virus infection to neoplasia will be emphasized. 4 units. *Smith, Keene, and staff*

259. Molecular Biology I: Protein and Membrane Structure/Function. See course description under the University Program in Cell and Molecular Biology. (Also listed as Anatomy 259 and Biochemistry 259.) 3 units. *Vanaman and staff*

260S. Interactions of Differentiated Cells. See course description for Anatomy 260S. (Also listed as Pharmacology 260S and Physiology 260S.) 2 units. *Conn, Jakoi, Padilla, and Vanaman*

264S. Chromosomes, DNA, and Evolution. Prerequisite: cell biology or genetics. (Also listed as Zoology 264S and under the University Program in Genetics.) 3 units. *Endow and Nicklas*

268. Molecular Biology II: Nucleic Acids. See course description under the University Program in Cell and Molecular Biology. (Also listed as Biochemistry 268 and Botany 268.) 3 units. *Modrich and staff*

269. Advanced Cell Biology. See course description under the University Program in Cell and Molecular Biology. (Also listed as Anatomy 269, Botany 269, and Zoology 269.) 3 units. *Endow and staff*

291. Basic Immunology. Structure, function, and specificity of immunoglobulins. Characteristics of antigens. Structure of primary and secondary lymphoid organs. Lymphocyte subpopulations and their interactions in primary and secondary cellular and humoral responses. Molecular genetics of immunoglobulin genes. Effector mechanisms. Biologic functions of histocompatibility gene products. Regulation of the immune response. 4 units. *Corley and staff*

296. Contemporary Molecular Immunology. A detailed study at the molecular level of some of the latest developments in immunology. The subject matter will be concerned with three general areas: (a) the molecular analysis of the cellular components and processes which underlie the biological behavior of cells involved in immune phenomena; (b) the chemical and physical properties of antigens and antibodies and the physical-chemical analysis of antigen-antibody interaction; (c) recent methodological advances contributing to or resulting from (a) and (b). Prerequisite: introductory immunology or equivalent. 3 units. *Cresswell, Day, and Sage*

For Graduates

323. Readings in Microbiology and Immunology. A course of readings and syntheses in restricted areas of bacteriology and immunology under the direction of individual staff members. 2 units. *Staff*

325. Medical Mycology. Comprehensive lecture and laboratory coverage of all the fungi pathogenic for humans. Practical aspects as well as future trends in the mycology, immunology, diagnosis, pathogenesis, and epidemiology of each mycotic agent will be explored. There will be several invited lecturers, each an internationally recognized scientist, discussing their particular areas of mycological expertise and current research. Prerequisite: consent of instructor. 4 units. *Mitchell*

330. Medical Immunology. A course designed to present the basic concepts of immunology as they relate to human disease. Emphasis will be on tumor immunology, autoimmunity, neuroimmunology, immunoheumatology, and immunologic deficiency diseases. 6 units. *Koren, Pisetsky, and staff*

331.1-331.8. Microbiology Seminar. Current topics in microbiology with seminars presented by students, faculty, and outside speakers. Required course for all students specializing in microbiology. 1 unit each. *Staff*

332.1-332.8. Immunology Seminar. Current topics in immunology with seminars presented by students, faculty, and outside speakers. Required course for all students specializing in immunology. 1 unit each. *Staff*

336. Immunogenetics. Antigens of tissues and organs, distribution, extraction, and chemistry. Phylogeny of iso-antigenic systems of humans and animals. Tests for histocompatibility including lymphocyte interactions and reactivity. Change in antigenicity and immune responsiveness in carcinogenesis. Immunologic factors in pregnancy and in homotransplantation of organs. (Also listed under the University Program in Genetics.) 2 units. *Amos and Ward*

337. Immunobiology of the Macrophage. A comprehensive study of the mononuclear phagocytic system. Areas to be discussed include the regulation of the immune response by macrophages and their products, their functions in microbial infections and in tumor surveillance; tissue distribution of monocytes and macrophages; functional heterogeneity of macrophages; and the use of macrophage cell lines. Prerequisite: Microbiology and Immunology 244 or 291. (Also listed as Pathology 394.) 2 units. *Adams, Koren, Snyderman, and Weinberg*

COURSES CURRENTLY UNSCHEDULED

- 242. Mechanisms of Microbial Pathogenicity
- 282. Molecular Microbiology
- 420. Cellular Immunophysiology

Music

Professor Douglass, *Chairman* (105 Mary Duke Biddle Music Building); Associate Professor Todd, *Director of Graduate Studies* (079 Mary Duke Biddle Music Building); Professor Kirkendale; Associate Professor Seebass; Assistant Professors Bartlet and Herlinger

The Department of Music offers work leading to the A.M. in composition and the A.M. and Ph.D. degrees in musicology. Applications are invited from students completing undergraduate curricula in music, as well as from qualified students in related disciplines. Nondegree students and especially graduate students from other departments may be admitted to graduate courses by consent of the instructor, according to their preparation. Students may be admitted to the Program in Medieval and Renaissance Studies (see section on Medieval and Renaissance Studies).

A reading knowledge of one foreign language is required at admission; two are required for the A.M. (including German), and three for the Ph.D. (usually including German and Latin). Students are strongly urged to acquire as much language facility as possible before beginning graduate study.

A detailed description of the requirements for the A.M. and Ph.D. is available upon request from the Director of Graduate Studies. The student should refer also to the description of general requirements of the University found in the chapter "Program Information."

201. Introduction to Musicology. Introduction to and assessment of reference materials, other bibliographic tools, and research methods for the field of musicology. Prerequisite: consent of instructor. 3 units. *Bartlet or Kirkendale*

211. Medieval Notation. Introduction to codicology and paleography; notation of plain chant and of polyphony through the fourteenth century. 3 units. *Herlinger*

212. Renaissance Notation. Mannered notation; fifteenth-century white notation; proportions; instrumental scores, partituras, and tablatures. Prerequisite: Music 211 or consent of instructor. 3 units. *Herlinger*

221. Music in the Middle Ages: Monophony. Selected topics. 3 units. *Seebass*

222. Music in the Middle Ages: Polyphony. Selected topics. 3 units. *Seebass*

223. Music in the Renaissance. Selected topics. 3 units. *Kirkendale*

224. Music in the Baroque Era. Selected topics. 3 units. *Douglass or Kirkendale*

226. Music in the Romantic Era. Selected topics. 3 units. *Todd*

290. Independent Study. 3 units. *Staff*

311S. Seminar in Medieval Music. 3 units. *Staff*

314S. Seminar in the Classic Period. 3 units. *Staff*

315S. Seminar in Nineteenth-and Twentieth-Century Music. 3 units. *Staff*

331S. Music and Rhetoric (Sixteenth through Eighteenth Centuries).
3 units. *Kirkendale*

341S. Problems in Music Theory. 3 units. *Herlinger or Todd*

351S. Studies in Musical Iconography. 3 units. *Seebass*

382S. Studies in Ethnomusicology. 3 units. *Seebass*

COURSES CURRENTLY UNSCHEDULED

225. Music in the Classic Era

227. Music in the Postromantic and Modern Eras

312S. Seminar in Renaissance Music

313S. Seminar in Baroque Music

392S. Interdisciplinary Colloquium

Specific topics of the seminars will be announced at least one semester in advance. Among the offerings may be "The Place of Music in Carolingian Culture," "Theory and Practice of *Musica Ficta*," "Monteverdi and His Time," "*Basso Ostinato* and Variation in the Baroque Era," "The Masses of Haydn, Mozart, and Beethoven," "Programmatic and Absolute Music in the Nineteenth Century," "Elements of Musical Acculturation in Bali and Lombok (Indonesia)," and "French Organ Music."

The University Program in Neurobiology

Professor Diamond, *Director* (psychology); Professors Erickson (psychology), Somjen (physiology), and Vanaman (microbiology and immunology); Associate Professors Graham (pathology), Hall (anatomy), and Kaufman (biochemistry); Assistant Professor Nadler (pharmacology)

Recent advances in neurobiology have resulted in new methods, such as immunohistochemistry, and in closer ties among the various approaches to studying the nervous system. For example, research on the neuroanatomical basis of behavior is more dependent than ever before on the chemical and cellular study of neurons. To keep pace with these changes the program in neurobiology has been designed for a small number of students who wish to study the nervous system at several levels, ranging from the molecular to the behavioral. In planning course work, each student will be guided by an advisory committee whose members come from a variety of departments. All students will be advised to take courses in neuroanatomy, neurophysiology, neuropharmacology, and neuropsychology. The heart of the training is a research apprenticeship that leads to a Ph.D. dissertation. Each student must affiliate with one of the participating departments—atomy, biochemistry, microbiology and immunology, pathology, pharmacology, physiology, psychology, and zoology—and must meet all the requirements of that department for the Ph.D. degree. Normally, the dissertation adviser and the student will be members of the same department. A complete list of faculty, including research interests, will be made available to prospective students. *See course listings under the participating departments.*

Pathology

Professor Jennings, *Chairman* (301B Davison); Professor D. Bigner, *Director of Graduate Studies* (207 Jones); Professors Adams, Bossen, Bradford, Fetter, Hackel, Johnston, Klintworth, Koepke, Pratt, Sommer, Vogel, and Wittels; Associate Professors S.

Bigner, Burger, Elchlepp, Graham, McCarty, Pizzo, Reimer, Shelburne, and Zwadyk; Assistant Professors Jirtle, Lewis, Michalopoulos, Sanfilippo, Schold, and Vollmer; Adjunct Associate Professor Swenberg; Adjunct Assistant Professor Brody

The Department of Pathology offers graduate work leading to the M.S. and Ph.D. degrees with areas of specialization such as subcellular and molecular pathology. Course work is designed to give a broad background in classical and modern pathology with emphasis on the application of modern research techniques. Students will be required to take such courses as are necessary to obtain a broad foundation, as well as courses applicable to areas of speciality and research. Further information including brochures giving details of departmental facilities, staff, trainee stipends, and the M.D.-Ph.D. program are available from the Director of Graduate Studies.

219. Molecular and Cellular Bases of Differentiation. See course description for Anatomy 219. (Also listed as Biochemistry 219, Microbiology and Immunology 219, and Physiology 230.) 3 units. *Padilla and staff*

250. General Pathology. The fundamentals of pathology are presented to the student. Lectures developing broad concepts of disease processes are given by the members of the senior staff. The emphasis is placed on etiology and pathogenesis of disease. Lectures. Prerequisites: histology and consent of instructor. 4 units. *Hackel or staff*

251. Laboratory Course in General Pathology. Laboratory session to complement Pathology 250. Gross and microscopic material is correlated with and related to disease processes. Pathology 250 may be taken concurrently. Prerequisites: histology and consent of instructor. 4 units. *Hackel or staff*

258. Cellular and Subcellular Pathology. This course is designed for students wishing to broaden their knowledge of cellular structure and cellular pathology. The course consists of lectures and seminars discussing the alterations in cellular structure and associated functions that accompany cell injury. Prerequisite: consent of instructor. Hours to be arranged. 2 units. *Shelburne and Sommer*

275. Fundamentals of Electron Microscopy. Emphasis will be placed on preparative procedures including freezing techniques and on the application of electron microscopy to ultrastructural pathology. Scanning electron microscopy, X-ray microanalysis, and scanning ion microscopy will be discussed in addition to conventional transmission electron microscopy. Limited laboratory experience included. 3 units. *Shelburne, Sommer, and Brody*

325. Cardiovascular Pathology. Cardiovascular disease processes will be studied, reviewing anatomic, embryologic, and physiologic features, and utilizing case material and gross specimens. Consideration will be given to principles of electrocardiography. Prerequisite: consent of instructor. 3 units. *Hackel*

353. Advanced Neuropathology. This course deals with current problems and research methods related to diseases which affect the nervous system. Prerequisite: consent of instructor. 3 units. *Vogel*

355. Graduate Seminar in Pathology. Discussions outlining the scope of modern pathology. This will include reports of original researchers by members of staff and visitors. 1 unit. *Bigner and staff*

357. Research in Pathology. Independent research projects in various fields of pathology. Hours and credit to be arranged. *Jennings and staff*

361, 362. Autopsy Pathology. A detailed consideration of the morphologic, physiologic, and biochemical manifestations of disease. Emphasis is on individual

work in the laboratory with tutorial supervision. Gross dissection; histologic examination; processing; analyzing of morphologic, microbiologic, and biochemical data; and interpretation of results. For advanced students. Prerequisites: Pathology 250 and consent of instructor. 3 to 6 units each. *Adams and staff*

364. Systemic Pathology. Systematic presentation of the characteristics of disease processes as they affect specific organ systems. Prerequisite: consent of instructor. 6 units. *Hackel and staff*

367. Special Topics in Pathology. Special problems in pathology will be studied with a member of the senior staff; the subject matter will be individually arranged. Hours to be arranged. 2 to 4 units. *Jennings and staff*

369. Ophthalmic Pathology. This course will consist of lectures, seminars, and laboratory sessions. The normal anatomy and embryology of the eye will be reviewed as a basis for the study of the various ocular disease processes. The more common diseases of the eye will be considered in detail. Problems in ophthalmic pathology will be discussed together with methods of solving them. 3 units. *Klintworth*

370. Developmental Pathology and Teratology. A systematic study of disease processes involving the prenatal, natal, and postnatal period. Emphasis will be placed on developmental anatomy and teratogenesis. The format includes seminars and clinicopathologic correlations derived from gross and microscopic material. Prerequisites: Pathology 250 and anatomy and histology. 3 units. *Bradford*

374. Pulmonary Pathology and Postmortem Pathophysiology. Emphasis will be on pulmonary pathology and pathophysiology of infectious, metabolic, environmental, and neoplastic diseases, and certain diseases of unknown etiology (e.g., sarcoid, alveolar proteinosis). Ventilatory experiments will be done on excised human lungs. 3 units. *Pratt*

377. Pathology of the Kidney. The course includes a comprehensive study of pathological, immunological, and clinical features of the glomerulonephritis, and pyelonephritis, as well as of metabolic, congenital, and neoplastic renal disorders. Lectures will be supplemented with gross and microscopic specimens, demonstrations, and special library studies. 3 units. *Sanfilippo*

380. Diagnostic Immunology. Diagnostic and laboratory procedures used in evaluating immunologic diseases: especially autoimmune, infectious, immunodeficiency, immunoproliferative, and hypersensitivity disorders. Emphasis is placed on the theoretical and practical aspects of testing procedures and their proper interpretation. Prerequisite: permission of instructor. 2 units. *Sanfilippo, Zwadyk, R. Buckley, and Snyderman*

381. Cancer Biology. Emphasis of the course will be on cellular biology of the cancer cell. The instructors will present topics on aspects of cancer research and will attempt to correlate them with the biologic and clinical behavior of specific forms of neoplasia. 2 units. *Michalopoulos and Falletta*

382. General Pathology for Toxicologists. General principles of pathology using examples from human and experimental toxicological disease. Prerequisites: courses in biochemistry, physiology, and histology (histology may be taken concurrently). 3 units. *Graham, Jennings, and pathologists from UNC and Research Triangle Park*

394. Immunobiology of the Macrophage. (Also listed as Microbiology 337.) 2 units. *Koren, Adams, and Snyderman*

COURSES CURRENTLY UNSCHEDULED

360. Cytochemistry

Pharmacology

Professor Kirshner, *Chairman* (439 Nanaline H. Duke); Professor Mills, *Director of Graduate Studies* (432 Nanaline H. Duke); Professors Ellinwood, Lack, Menzel, Ottolenghi, Schanberg, Shand, Slotkin, and Wilder; Associate Professors Abou-Donia, Conn, Davis, Gutman, Rosen, and Strauss; Assistant Professors Bjornsson, Fuchs, Kuhn, McNamara, Nadler, and Whorton; Professor Emeritus Bernheim; Adjunct Professors Cuatrecasas and Nichol; Adjunct Associate Professor Viveros; Associate Medical Research Professor W. Wilson; Assistant Medical Research Professors Bartolome, Shrivastav, Smith, and S. Wilson

The Department of Pharmacology offers graduate work leading to the Ph.D. degree. The department considers a strong background in basic science as necessary, serious consideration being given to candidates with majors in biology, chemistry, mathematics, and physics. There is no foreign language requirement.

For Seniors and Graduates

210, 211. Individual Study and Research. Directed reading and research in pharmacology. Prerequisite: consent of Director of Graduate Studies. 3 to 9 units each. *Staff*

219. Tutorial in Pharmacology. Guided independent study of original literature. Credit to be arranged. *Staff*

250. Pharmacology: Mode Action of Drugs. Studies and discussion of the pharmacological action of drugs in terms of biochemical and physiological processes. Four lectures, one clinical correlation, and two conferences per week. 5 units. *Staff*

256. Human Nutrition. Nutrition principles with emphasis on physiology and pharmacology. Topics include the chemical basis for nutrient requirements, application to practical diets; parenteral nutrition; influence of dietary intake on disease (cardiovascular disease, diabetes, and inborn errors of metabolism); optimal dietary intake; impact of food technology on human nutrition, growth, maturation, and lactation; and recent advances in micronutrient requirements. 2 units. *Menzel*

260S. Interactions of Differentiated Cells. See course description for Anatomy 260S. (Also listed as Microbiology and Immunology 260S and Physiology 260S.) 2 units. *Conn, Jakoi, Padilla, and Vanaman*

270. Neurobiology I. See course description for Physiology 270. (Also listed as Anatomy 270.) 3 units. *Moore and staff*

280. Student Seminar in Pharmacology. Preparation and presentation of seminars to students and faculty on topics of broad interest to pharmacology. Required of all pharmacology graduate students. 2 units. *Whorton*

For Graduates

301. Physical Chemistry of Aqueous Solutions. An intensive study of the major topics of aqueous solutions including stoichiometry, chemical equilibrium, elementary thermodynamics, experimental kinetics, and electrochemistry. Practical problem sets and problem review sessions. Prerequisites: two years of college chemistry. 3 units. *Wilder*

302. Statistical Methods in Pharmacology and Toxicology. Classical techniques for hypothesis testing and point and interval estimation using the binomial,

normal *t*, *F*, and Chi square distribution; nonparametric technique; applications in pharmacology and toxicology; use of computer-based statistical packages. Fall semester. 3 units. *Wilkinson*

330. Pharmacological Basis of Clinical Medicine. Detailed analysis of the mechanisms of action and rationale for use of pharmacologic agents in disease states. 4 units. *Shand and staff*

331. Laboratory Methods in Pharmacology. Tutorial laboratory training in various fields of pharmacology including neuropharmacology, cardiovascular pharmacology, biochemical pharmacology, and biophysical pharmacology. Prerequisite: consent of instructor. 3 to 6 units. *Staff*

333. Principles of Pharmacology and Toxicology I. Drug absorption, distribution, excretion and metabolism, basic and clinical pharmacokinetics, Hansch correlation of structure and activity, stereochemistry, and drug action. May be taken separately from Pharmacology 334. 3 units. *Slotkin and staff*

334. Principles of Pharmacology and Toxicology II. Drug receptor theory and its practical applications, pharmacokinetics and pharmacodynamics of toxic substances, mechanisms of toxicity, adverse drug reactions and interactions. May be taken without Pharmacology 333 with permission of instructor. 3 units. *Rosen and staff*

335. Cellular Pharmacology. Relation of receptor stimulation, intracellular messengers, and target cell responses. Receptor theory including mathematical development and modeling. Target cell desensitization and supersensitization as well as qualitative evaluation of receptors by biochemical, physiological, and pharmacological criteria are included. Course emphasizes experimental applications in autonomic nervous system and endocrine target cells. 3 units. *Rosen and staff*

347, 348. Seminar in Toxicology. (Also listed as Biochemistry 347, 348.) 1 unit per semester. *Lynn and Abou-Donia*

354. Mammalian Toxicology. Principles of toxicology as related to humans. Emphasis on the molecular basis for toxicity of chemical and physical agents. Subjects include metabolism and toxicokinetics, toxicologic evaluation, pesticides, metals and industrial chemicals, solvent toxicity, food additives, natural toxins, radiation and radioactive materials; mutagenicity, pathology, carcinogenicity, immunology, teratogenicity; reproductive system, pulmonary, liver, kidney, eye, blood, behavioral cardio- and neurotoxicology; management of poisoning, epidemiology, risk assessment and regulatory toxicology. Taught in alternate years in the spring semester. 4 units. *Abou-Donia and staff*

360. Neuropharmacology. Seminar-lecture course emphasizing neurotransmitter mechanisms and the mechanisms of action of drugs used to modify nervous system function. Material will be drawn from recent literature. Prerequisite: Physiology 270 or consent of instructor. 3 units. *Nadler*

364. Neurotoxicology. Adverse effects of drugs and toxicants on the central and peripheral nervous system; target sites and pathophysiology aspects of neurotoxicity; factors affecting neurotoxicity, screening and assessment of neurotoxicity in humans; experimental methodology for detection and screening of chemicals for neurotoxicity. 3 units. *Abou-Donia and staff*

372. Research in Pharmacology. Laboratory investigation in various areas of pharmacology. Credit to be arranged. *Staff*

417. Cellular Endocrinology. (Also listed as Physiology 417.) 2 units. *Lebovitz*

Philosophy

Professor Golding, *Chairman* (201K West Duke); Professor Peach, *Director of Graduate Studies* (201E West Duke); Professors Mahoney and Sanford; Associate Professors Posy and Roberts; Assistant Professors Brandon, Jackson, and Wartenberg; Professor Emeritus Welsh

The Department of Philosophy offers graduate work leading to the A.M. and Ph.D. degrees. Tutorial work complements formal instruction. Students may specialize in any of the following fields: the history of philosophy, logic, philosophy of science, epistemology, metaphysics, philosophy of mind, philosophical analysis, ethics, aesthetics, political philosophy, philosophy of law, philosophy of medicine, and philosophy of religion.

Individual programs of study are developed for each student. The following requirement, however, is fundamental: the preliminary examination for the Ph.D., which may be taken only after a student has met the language requirement for that degree, should be taken after the second year of study. In these examinations students are expected to combine historical knowledge with critical understanding.

Work in a minor or related field, not necessarily confined to any one department, is encouraged but not required. A minor normally includes 6 units for the A.M. or the Ph.D. degree and may include more as a student's program requires or permits.

A student who meets the general requirements of the Graduate School may earn the A.M. degree in philosophy by passing an oral master's examination. This examination, which can be the defense of either a master's thesis or an alternative academic exercise approved by the department and the student's committee, is normally given in the student's fourth term of full-time registration. The examination can be given earlier in two special circumstances:

1. A student with a strong undergraduate background in philosophy who satisfies the department of his or her qualifications by submitting several samples of written work before beginning the program may be admitted to the master's program with the understanding that the master's examination can be given in the second or third term of full-time registration.

2. A student who combines the A.M. program in philosophy with another advanced degree program, such as the programs for the J.D., the M.D., or the Ph.D. in another field, will register as a full-time graduate student of philosophy for only two terms, the minimum registration that meets the general requirements of the Graduate School for the A.M. degree. These two terms of full-time registration need not be consecutive, and their position in the student's overall program is determined in individual cases. A student in a combined program will normally do some work in philosophy while registered in the student's primary program and do some work in the primary field while registered in philosophy. The master's examination can be given in the second term of full-time registration as a philosophy graduate student or in a later term when the student is registered in the primary program.

A student in the philosophy Ph.D. program who meets the general requirements of the Graduate School for the A.M. degree may earn this degree by passing the preliminary for the Ph.D. degree.

A reading knowledge of at least one foreign language, ancient or modern, is required for the Ph.D. degree. Students may not take their preliminary examinations until they have demonstrated this ability. More than one language may be required where this is judged appropriate to the research demanded by the candidate's dissertation.

For Seniors and Graduates

203S. Contemporary Ethical Theories. Study of the nature and justification of basic ethical concepts in the light of the chief ethical theories of twentieth-century British and American philosophers. 3 units. *Golding or Jackson*

204S. Philosophy of Law. Natural law theory and positivism, the idea of obligation (legal, political, social, moral), and the relation of law and morality. 3 units. *Golding*

206S. Responsibility. Investigation of the relationship between responsibility in the law and moral blameworthiness; excuses and defenses; the roles of such concepts as act, intention, motive, ignorance, and causation. 3 units. *Golding*

208S. Political Values. Analysis of the systematic justification of political principles and the political values in the administration of law. 3 units. *Golding or Wartenberg*

211S. Plato. Selected dialogues. 3 units. *Staff*

217S. Aristotle. *Metaphysics* or the *Nicomachean Ethics*. 3 units. *Staff*

218S. Medieval Philosophy. Selected problems in medieval philosophy. (Also listed under Medieval and Renaissance Studies.) 3 units. *Mahoney*

219S. Late Medieval and Renaissance Philosophy. Selected problems. (Also listed under Medieval and Renaissance Studies.) 3 units. *Mahoney*

225S. British Empiricism. A critical study of the writings of Locke, Berkeley, or Hume with special emphasis on problems in the theory of knowledge. 3 units. *Peach*

227S. Continental Rationalism. A critical study of the writings of Descartes, Spinoza, or Leibniz with special emphasis on problems in the theory of knowledge and metaphysics. 3 units. *Peach*

228S. Recent and Contemporary Philosophy. A critical study of some contemporary movements, with special emphasis on analytic philosophers. 3 units. *Posy or Wartenberg*

230S. The Meaning of Religious Language. (Also listed as Religion 230S.) 3 units. *Poteat*

231S. Kant's Critique of Pure Reason. 3 units. *Wartenberg or Posy*

233S. Methodology of the Empirical Sciences. Recent philosophical discussion of the concept of a scientific explanation, the nature of laws, theory and observation, probability and induction, and other topics. Prerequisite: consent of instructor. 3 units. *Brandon*

234S. Problems in the Philosophy of Science. Selected problems in the physical and nonphysical sciences such as space and time, measurement and determinism. Prerequisite: consent of instructor. 3 units. *Brandon*

235S. Hegel and Marx. Hegel's philosophy and its influence on Marx. 3 units. *Wartenberg*

251S. Epistemology. Selected topics in the theory of knowledge, e.g., conditions of knowledge, scepticism and certainty, perception, memory, knowledge of other minds, and knowledge of necessary truths. 3 units. *Sanford*

252S. Metaphysics. Selected topics: substance, qualities and universals, identity, space, time, causation, and determinism. 3 units. *Sanford*

253S. Philosophy of Mind. Analysis of concepts such as thought and belief; issues such as mind-body relations, thought and action, the nature of persons and personal identity. 3 units. *Roberts or Sanford*

254S. Philosophy of Religion. Topics such as proofs of the existence of God; meaningfulness of religious language; the problems of evil, immortality, and resurrection. 3 units. *Roberts*

COURSES CURRENTLY UNSCHEDULED

202S. Aesthetics: The Philosophy of Art

205S. Philosophy of History

232S. Recent Continental Philosophy

291S, 292S. Seminar in Special Fields of Philosophy

311. Philosophy and Medicine

331, 332. Seminar in Special Fields of Philosophy

Physical Therapy

Professor Bartlett, *Chairman* (045 Hospital); Associate Professor Branch, *Director of Graduate Studies* (045 Hospital); Associate Professor Villanueva; Assistant Professors Duncan, Horton, and Nelson; Assistant Clinical Professors Eckel and Riordan

The Department of Physical Therapy offers an entry level professional program leading to the M.S. degree. To be eligible for admission to the program, applicants must have obtained a baccalaureate degree and have a background in the basic sciences and social sciences, including course work in biology, chemistry, physics, and psychology.

The program is designed to provide for integration of classroom knowledge and clinical learning experiences essential for the competent practice of physical therapy. In view of this integrated curriculum, failure in a major course within a semester would prevent the student from continuing in the program. Major courses are all courses offered by the Department of Physical Therapy as well as required courses offered by the Department of Anatomy. A grade of *F* (or *noncredit* in the case of Physical Therapy 342, 343, and 344) in any of these courses will occasion withdrawal from the program. Program requirements also include a comprehensive examination, at the completion of the curriculum, and a research project. Further information may be obtained from the Director of Graduate Studies, Department of Physical Therapy, Box 3965, Duke University Medical Center, Durham, North Carolina 27710.

210. Independent Study. Designed for nonmajors. Prerequisite: consent of instructor. Credit to be arranged. *Staff*

301. Introduction to Scientific Inquiry. Theory and methods of research process, research design, data collection, statistical techniques, introductory computer training. 2 units. *Nelson*

302. Research. Development of a research project protocol. 1 unit. *Nelson and staff*

303. Research. Completion of research project under the supervision of a faculty adviser; guidance in the use of the computer for statistical analysis. 3 units. *Nelson and staff*

304. Seminar in Applied Neurophysiology. Selected topics in neurophysiology, with emphasis on those most relevant to the theory and practice of physical therapy. 1 unit. *Nelson*

313, 314. Physical Agents. Physical aspects and physiological effects of selected physical agents, including massage, superficial heat and cold, ultrasound,

high and low frequency electrical currents; electrodiagnostic testing, introduction to electromyography and nerve conduction studies, and principles and application of biofeedback. 2 units each. *Branch, Eckel, and Nelson*

317. Kinesiology. Fundamentals of arthrology and myology, movement and joint description, surface anatomy, principles of biomechanics and anthropometry. 2 units. *Villanueva*

318. Arthrology and Pathokinesiology. Detailed study of the arthrology and kinesiology of the trunk and limbs during normal and pathological conditions, with emphasis on the sequential electromyographic and joint motion analysis of body segments during selected human movement patterns, including locomotion. 3 units. *Villanueva*

319. Introduction to Evaluation and Patient Care. Orientation to basic patient care skills, including reaction to illness. Introduction to Problem-Oriented Record System. Principles and methods of gross evaluation, including assessment of muscle function, joint mobility, neurological and respiratory function, posture, gait, and physical level of independence. Opportunities for direct patient care in laboratory and clinic. 2 units. *Eckel and Villanueva*

320. Evaluation and Therapeutic Procedures I. Specific assessment of neuromuscular and cardiopulmonary functions. Physiological basis of therapeutic intervention, and specific exercise programs. Seminars in patient management. 4 units. *Duncan and staff*

321. Evaluation and Therapeutic Procedures II. Assessment and treatment of specific neuromuscular and cardiopulmonary problems. Introduction to techniques of neuromuscular facilitation. Seminars in patient management. 2 units. *Duncan and staff*

322. Evaluation and Therapeutic Procedures III. Description and observation of the development of the normal child, followed by the discussion of various pediatric problems. Introduction to the neurophysiological basis for the evaluation and treatment of children and adults with central nervous system disorders; emphasis on assessment of abnormal movement and selection of appropriate therapeutic programs. Problems associated with spinal cord injuries, methods of therapeutic intervention, and functional training. 3 units. *Bartlett, Duncan, and Eckel*

324. Prosthetics and Orthotics. Basic knowledge of the effects of prostheses and orthoses on trunk and extremity function; includes components and materials, design and fabrication, principles of fit, alignment and operation of device, evaluation, gait, and activities training procedures. 2 units. *Staff*

332. Physical Therapy and Health Services: Administration and Issues. Planning, organizing, delivering, and evaluating physical therapy and health services. Examination of health policy and issues. Principles of administration, leadership styles, and management roles. 3 units. *Bartlett and Riordan*

334. Introductory Pathology. A review of normal cells and tissues; fundamentals of pathology with emphasis on broad concepts of disease. 2 units. *Branch*

336. Medical Sciences. The clinical manifestations and management of common medical and surgical disorders. Lectures by physicians, physical therapists, clinical pharmacists, and other health personnel; selected laboratory experiences. Areas covered include orthopedics, burns, rheumatology, cardiopulmonary disorders, neurology, neurosurgery, hematology, and gerontology. 5 units. *Branch and staff*

340. Special Topics in Physical Therapy. Opportunity for study under the direction of an individual staff member. Prerequisite: consent of Director of Graduate Studies. Credit to be arranged. *Staff*

342. Directed Clinical Experience in Physical Therapy I. Short-term observational and supervised learning experiences in local physical therapy settings. 1 unit. *Eckel and clinical staffs*

343. Directed Clinical Experience in Physical Therapy II. Full-time supervised clinical learning experiences in physical therapy settings within limited radius of the University. 2 units. *Eckel and clinical staffs*

344. Directed Clinical Experience in Physical Therapy III. Full-time supervised clinical learning experiences in physical therapy settings throughout the country. 3 units. *Eckel and clinical staffs*

Physics

Professor Lewis, *Chairman* (118 Physics); Professor Fairbank, *Director of Graduate Studies* (112 Physics); Professors Biedenharn, Bilpuch, Cusson, Evans, Han, Meyer, Roberson, Robinson, Walker, Walter, and Weller; Associate Professors De Lucia, Fortney, Goshaw, and Herbst; Assistant Professors Behringer, Lucas, and Palmer; Adjunct Professors O'Foghludha and Robl

The Department of Physics offers graduate work for students wishing to earn the A.M. or Ph.D. degree. In addition to a balanced program of basic graduate courses, the department offers specialized courses and seminars in several fields in which research is being done by faculty and staff.

With the help of faculty advisers, students select a course program to fit their needs, including work in a related field, usually mathematics or chemistry. Students are encouraged to begin research work early in their careers.

For Seniors and Graduates

211, 212. Modern Physics. Fundamental concepts of quantum theory and the study of quantum phenomena including atomic and molecular structure and spectra, solids, statistical physics, nuclear physics, and elementary particles. Prerequisite: Physics 181; for 212: Mathematics 230 as a corequisite. 3 units each. *Staff*

214. Introduction to Solid-State Physics. (Also listed as Electrical Engineering 214.) 3 units. *Hacker or staff*

215. Introduction to Quantum Mechanics. Wave mechanics and elementary applications, the hydrogen-like atoms, electron spin and angular momentum, operators and eigenvalues, stationary state perturbation theory, identical particles. Prerequisites: Physics 161 and 181 and Mathematics 181 and 230 (may be taken concurrently). 3 units. *Evans or Biedenharn*

217S, 218S. Advanced Physics Laboratory and Seminar. Experiments involving the fields of electricity, magnetism, heat, optics, and modern physics. 6 units. *Meyer*

220. Electronics. Basic elements of modern electronics including AC circuits, transfer functions, solid-state service, transistor circuits, operational amplifier applications, digital circuits, and computer interfaces. 3 units. *Fortney*

240. Computer Application to Physical Measurement. Hardware and software techniques for computer-assisted data acquisition, display, and control in the modern experimental environment. Theory and application of discrete signal analysis including digital filters, Z-transform, and fast Fourier transform. Lecture and laboratory. Prerequisite: Physics 171 or consent of instructor. 3 units. *Fortney*

For Graduates

302. Advanced Mechanics. The fundamental principles of Newtonian mechanics, general dynamics of systems of particles and rigid bodies, the methods of Lagrange and Hamilton, generalized mechanics. 3 units. *Han*

303. Statistical Mechanics. Fundamental laws of thermodynamics and statistical mechanics with applications to physics and chemistry. Classical and quantum ideal gases; approximate methods for real gases and liquids. Prerequisite: Physics 215. 3 units. *Behringer*

305. Introduction to Nuclear Physics. Phenomenological aspects of nuclear physics, interaction of gamma radiation and charged particles with matter, nuclear detectors, particle accelerators, radioactivity, basic properties of nuclei, nuclear systematics, nuclear reactions, particle scattering, nuclear models of the deuteron, nuclear forces, parity. 3 units. *Roberson*

308. Introduction to High-Energy Physics. High-energy processes; electromagnetic, weak, and strong interactions. Experimental instrumentation. 3 units. *Walker or Goshaw*

309. Solid-State Physics I. Properties of matter in the condensed state; crystal lattices, electrons in metals and semiconductors, band theory, nonmetallic solids, lattice dynamics, and phonons. Prerequisites: Physics 215 and 303. 3 units. *Palmer*

310. Solid-State Physics II.* Elementary excitations and their interactions in the condensed state of matter; scattering theory and correlation functions; magnetic interactions in solids, superconductivity; amorphous solids. Prerequisites: Physics 309 and 316. 3 units. *Palmer*

316. Principles of Quantum Theory. Original and fundamental concepts of quantum theory, wave and matrix mechanics, theory of measurements, exclusion principle, and electronic spin. Prerequisites: Physics 215 and 302. 3 units. *Biedenharn or Evans*

317. Intermediate Quantum Theory. General operator methods, angular momentum, Dirac electron theory. Second quantization; symmetry principles and conservation theorems. Applications to the theory of solids, of nuclei, and of elementary particles will be stressed. Prerequisite: Physics 316. 3 units. *Evans or Biedenharn*

318. Electromagnetic Field Theory. Electrodynamics, theory of wave optics, radiation of electric and magnetic multipole fields, special relativity, covariant electrodynamics, Lienard-Wiechert potentials, scattering and dispersion, Hamiltonian field equations. Prerequisite: Physics 223. 3 units. *Cusson*

331. Quantum Electronics.* Electromagnetic radiation and its interaction with matter. Lasers, nonlinear optics, submillimeter waves, detection theory, propagation. 3 units. *DeLucia*

341. Advanced Topics in Quantum Theory.* Introduction to relativistic quantum field theory, Lorentz and Poincaré groups, quantization of free fields, interacting fields and *S*-matrix, applications of quantum electrodynamics and dispersion relations. Prerequisite: Physics 317. 3 units. *Biedenharn*

346. Topics in Theoretical Physics.* The content of this course will vary from year to year. General methods in quantum mechanics such as group theory and its applications, elementary particle theory, field theory, theory of solids, theoretical nuclear physics, atomic and molecular structure. Prerequisites: Physics 316 and 317. 3 units. *Staff*

*Offered on demand.

COURSES CURRENTLY UNSCHEDULED

- 255. Astronomy for Teachers
- 304. Advanced Topics in Statistical Mechanics
- 306. Low Temperature Physics
- 312. Phase Transitions and Critical Phenomena
- 330. Nuclear Structure Theory
- 333. Molecular Reaction Dynamics
- 335. Molecular Spectroscopy
- 342. Theory of Elementary Particles
- 343. Nuclear Physics
- 344. Advanced Nuclear Physics
- 345. High-Energy Physics
- 351, 352. Seminar
- 397, 398. Low Temperature and Solid-State Seminar

Physiology

Professor Johnson, *Chairman* (388 Nanaline H. Duke); Associate Professor McManus, *Director of Graduate Studies* (324 Nanaline H. Duke); Professors Blum, Diamond, Gutknecht, Jöbssis, Lauf, Lieberman, Moore, Reynolds, Salzano, Schmidt-Nielsen, Somjen, Spach, Tanford, and Wallace; Associate Professors N. Anderson, Bennett, Erickson, Greenfield, Kylstra, Mandel, Mills, Padilla, Schomberg, Simon, and Wolbarsht; Assistant Professors P. A. W. Anderson, Camporesi, Dennis, Handwerger, Jones, Wechsler, and Yarger; Adjunct Assistant Professors Carter, Horres, and McHale; Assistant Medical Research Professors Baumann, Beall, Hines, and Sylvia

The Department of Physiology offers graduate work leading to the Ph.D. degree. Before undertaking this program a student should have a strong background in basic sciences including course work in mathematics, biology, physics, and chemistry through physical chemistry. Undergraduates with this background may have majors in any of the following areas: biology, chemistry, physics, mathematics, engineering, or computer sciences. There is no foreign language requirement.

For Seniors and Graduates

200. Introduction to Physiology. Lectures and conferences on cell and organ physiology. Human and medical aspects are stressed in clinical conferences. The neurophysiology section is given in a three-week period following the end of the semester. Limited to students whose training requires knowledge of human physiology as it pertains to medicine. Five lectures and two conferences per week. Prerequisite: consent of course leader. Fall. 5 units. *Padilla and staff*

203. Introduction to Biophysics and Biophysical Chemistry. Prerequisites: calculus and physics and physical chemistry. 2 units. *Tanford*

204. Introduction to Modern Physiology. Flow of fluids in tubes, ion transport mechanisms, and endocrine systems are examined in terms of how such processes enter into the functioning of intact organs such as heart, lung, gut, and central nervous system. Particular emphasis is given to the control of physiological

function both at the cellular and higher levels of organization. Required of all graduate students in physiology. Others must have consent of instructor. Prerequisites: at least one year each of physics and calculus and biology; chemistry through organic chemistry; physical chemistry is strongly recommended. Spring. 4 units. *Blum and staff*

207. The Heart in Health and Disease. Physiology at the organ systems level, including cardiac electrophysiology and mechanics, arrhythmias, ventricular-atrial function, cardiogenesis, congenital disorders, coronary blood flow, and cardiovascular control mechanisms. Designed to be most valuable to medical students as part of a coordinated program of study such as the Cardiovascular Study Program. Fall. 2 units. *P. A. W. Anderson and staff*

208. Respiratory System in Health and Disease. Primary emphasis on the physiology of respiration. Topics include pulmonary mechanics; gas exchange; ventilation-perfusion relationships; central and peripheral regulation of ventilation and respiratory responses to exercise, altitude, and hyperbaric environments. Spring. 2 units. *Salzano and Kylstra*

210. Individual Study. Directed reading and research in physiology. Prerequisite: consent of Director of Graduate Studies. 3 to 9 units each. *Staff*

217. Membrane Transport. Chemical composition and ultrastructure of biological membranes; ionic and osmotic equilibria across the membranes of individual cells; passive and active ionic transport; the role of ATPase; carrier-mediated diffusion of nonelectrolytes; integration of transport processes to produce molecular movements across organized epithelia; e.g., amphibian skin and bladder, and gastrointestinal mucosa. Prerequisite: consent of instructor. Fall. 3 units. *Mandel and staff*

219S. Seminar in Membrane Physiology. Offered at Beaufort. 2 units. *Gutknecht*

230. Molecular and Cellular Bases of Differentiation. See course description for Anatomy 219. (Also listed as Biochemistry 219, Microbiology and Immunology 219, and Pathology 219.) Fall. 3 units. *Padilla and staff*

260S. Interactions of Differentiated Cells. See course description for Anatomy 260S. (Also listed as Microbiology and Immunology 260S and Pharmacology 260S.) 2 units. *Conn, Jakoi, Padilla, and Vanaman*

270. Neurobiology I. Interdisciplinary approach to neuronal function at the cellular and molecular levels. Topics will include subcellular structural organization, physiology and pharmacology of excitable membranes, impulse generation and conduction, neurotransmitters, proteins, pre- and postsynaptic organization and function. (Also listed as Anatomy 270 and Pharmacology 270.) 3 units. *Moore and staff*

272S. Physiology of the Central Nervous System. Prerequisites: Physiology 200 or equivalent, Physiology 270 or equivalent, and some knowledge of neuroanatomy; for undergraduates, consent of instructor. (Also listed as Psychology 272S.) Spring. 2 or 3 units. *Somjen and staff*

280. Student Seminar in Physiology. Preparation and presentation of seminars to students and faculty on topics of broad interest to physiology. Required of all physiology students. 2 units. *Simon*

281. Teaching in Physiology. Participation with departmental staff in various teaching activities. Lectures, conferences, tutorials, and preparation of self-instructional teaching materials. Required of graduate students in the Department of Physiology. Credit to be arranged. *Staff*

For Graduates

302. Advanced Topics and Research Seminar in Smooth and Striated Muscle. Prerequisite: consent of instructors. (Also listed as Anatomy 302.) 1-3 units. *N. Anderson, Reedy, and staff*

320. Gastrointestinal Physiology. The normal physiology, mechanisms of control, and transport characteristics of the human gastrointestinal tract and its associated glands and organs (salivary, pancreas, liver) are presented through a series of lectures, problems, and demonstrations. The mechanisms of secretion and reabsorption are treated at a cellular level. Problems focus on quantitation of gastrointestinal function. Spring. 3 units. *Mandel, Akwari, Jones, and N. Anderson*

321. Renal Physiology. Basic renal mechanisms involved in the elaboration of urine including concentrating and diluting mechanisms, hemodynamics, and regulation of acid-base balance. Both basic physiological processes and pathophysiological alterations will be considered. Spring. 3 units. *Dennis and staff*

372. Research in Physiology. Laboratory investigation in various areas of physiology. Credit to be arranged. *Staff*

383. Physiological Instrumentation. Electronic methods of measurement of physiological variables. The operational amplifier is used as the active building block in appropriate feedback circuits containing only passive elements to make a wide range of linear instruments including analog computers. Digital logic and computing elements are also developed. Spring. 3 units. *Moore or staff*

390. Membrane Biology. Various aspects of cell membranes and membrane proteins and lipids. Specific topics are chosen based on student interest and current literature discussed. Prerequisite: consent of instructor. Spring. 2 units. *Reynolds*

401. Metabolic Physiology. The control of gluconeogenesis, protein degradation, the storage and mobilization of glycogen and of lipids will be examined both at cellular level (e.g., metabolic compartmentation, futile cycling, enzyme modification) and in terms of interactions between tissues such as liver, kidney, and muscle. Strategies for metabolic adaptation to exercise, cold environment, starvation, obesity, and birth will be discussed. Prerequisites: Physiology 204 and one year of biochemistry. Fall. 3 units. *Blum*

416. Biophysics of Excitable Membranes. Advanced quantitative approach to bioelectric membrane phenomena. Topics include the cable properties of axons, voltage clamping theory and techniques, the ionic mechanisms of excitation, long-term changes in excitability, mechanisms of synaptic transmission, receptor mechanisms, models of membranes and neurons, and some pharmacology of excitable membranes. Prerequisite: background in calculus and physics and physical chemistry is recommended. Spring. 3 units. *Moore and Wolbarsht*

417. Cellular Endocrinology. Current concepts of the mechanisms of action of hormones at the cellular level, including hormone-receptor interactions, secondary messenger, regulation of protein synthesis, growth and differentiation, control of salt and water balance, regulation of substrate storage and mobilization, modulation of hormone secretion. (Also listed as Pharmacology 417.) 2 units. *Staff*

418. Reproductive Biology. An in-depth study of male and female reproductive processes including hypothalamic, pituitary, and gonadal control mechanisms, as well as the physiology of pregnancy and parturition. Lectures by guest clinical faculty will emphasize the interface between basic science and clinical aspects. The lecture material in each section of the course is followed by seminar presentations which will contribute to Physiology 424, a corequisite for the course. (Also listed as Anatomy 418.) Spring. 2 units. *Schomberg, N. Anderson, and Tyrey*

424. Seminar in Reproductive Biology. Selected topics in reproductive biology will be chosen for in-depth reading and analysis in the seminar format. Can be taken independently or corequisite with Physiology 418. (Also listed as Anatomy 424.) Spring. 1 unit. *Schomberg, N. Anderson, and Tyrey*

COURSES CURRENTLY UNSCHEDULED

301. Oxygen and Physiological Function

362. Cardiac Muscle Physiology

419. Topics in Mathematical Physiology

420. Cellular Immunophysiology

Political Science

Professor Holsti, *Chairman* (214 Perkins); Professor Price, *Director of Graduate Studies* (314 Perkins); Professors Barber, Braibanti, Cleaveland, Fish, Hall, Horowitz, Hough, Kornberg, Leach, Paletz, and Spragens; Associate Professors Eldridge, Johns, Lange, McKean, and Valenzuela; Assistant Professors Entman, Falcone, Grieco, Hoadley, and Kruzel; Professors Emeriti Ball, Cole, Grzybowski, Hallowell, Kulski, and Simpson; Part-Time Associate Professor O'Barr

The Department of Political Science offers graduate work leading to the A.M. and Ph.D. degrees. Before being admitted to candidacy for the Ph.D. degree, an applicant must have qualified for the A.M. degree.

Instruction is designed to prepare the student for teaching and research, for government service, and for other work related to public affairs. Before undertaking graduate study in political science, a student is ordinarily expected to have completed at least 12 semester hours of course work in political science. Instruction is currently offered in the following fields: American government and politics, comparative government and politics, political theory, and international relations.

The candidate for the degree of Doctor of Philosophy in political science must take at least sixteen courses in all, including twelve in the department, and demonstrate competence in at least two general fields of the discipline as well as in a third general field or in a specialized subfield or in a field external to the department. The candidate must also demonstrate a reading knowledge of two foreign languages or must demonstrate proficiency in one foreign language and in the use of statistics.

The terminal degree of Master of Arts, for those who do not intend to continue with doctoral studies, is awarded following successful completion of: (1) eight one-semester courses of 3 units each, at least half of which must be in political science; and (2) the A.M. thesis. In addition, candidates for the A.M. degree must demonstrate competence in one foreign language or in statistics.

Further details on the graduate program in political science, the departmental facilities, the staff, and available financial aid may be obtained from the Director of Graduate Studies, Department of Political Science.

For Seniors and Graduates

201S. Problems in International Security. Major security issues. Prerequisite: a course in international relations or foreign policy. 3 units. *Kruzel*

203. Politics and the Media of Mass Communication. Analysis of crucial aspects of the media-politics relationship. Media's effects on political socialization, public opinion, political participation, pluralism, power, and authority. Government's impact on the media. Prerequisite: consent of instructor. 3 units. *Paletz*

204S. Ethics in Political Life. Ethical issues arising in the conduct of political vocations and activities. (Also listed as Public Policy Studies 204S.) 3 units. *Spragens*

205S. Science, Politics, and Government. See course description for Psychology 261S. (Also listed as Public Policy Studies 255S and Sociology 261S.) 3 units. *Staff*

207. American Constitutional Interpretation. Development of the Constitution of the United States through Supreme Court decisions. 3 units. *Fish*

208S. Analyzing the News. (Also listed as Public Policy Studies 240S.) 3 units. *Entman*

209. Problems in State Government and Politics. 3 units. *Leach*

211S. Current Problems and Issues in Japanese Politics. Sources of strength and weakness in the Japanese economy, the rise of new issues and strains in postindustrial society, changes in the party system and decision-making process, the possible transfer of power, the challenge of Japan's new world role. 3 units. *McKean*

213S. Theories of International Political Economy. Comparison and assessment of traditional and modern theories in terms of their logical and empirical validity. 3 units. *Grieco*

214S. The Politics of Scarcity. Issues in politics, economics, ethics, and policy associated with conflicts arising from long-term scarcity in crucial resources. 3 units. *McKean*

218S, 219S. Political Thought in the United States. 218S: the Founders and their European and Puritan antecedents; debates over slavery and the Union. 219S: topics in late nineteenth- and twentieth-century thought. 6 units. *Price*

220S. Problems in International Politics. Prerequisite: one course on international relations or foreign policy or diplomatic history. 3 units. *Holsti or Hough*

223. Political Philosophy from Plato to Machiavelli. Intensive analysis of the political philosophies of Plato and Aristotle, a survey of medieval political thought and an analysis of the significance of Machiavelli. 3 units. *Staff*

224. Modern Political Theory. A historical survey and philosophical analysis of political theory from the beginning of the seventeenth to the middle of the nineteenth century. The rise of liberalism, the Age of Enlightenment, the romantic and conservative reaction, idealism, and utilitarianism. 3 units. *Spragens*

225. Comparative Government and Politics: Western Europe. Rise of modern political parties; extension of the suffrage; entry of bourgeoisie, peasants, and workers into politics; center-periphery conflicts; emergence of the welfare state and of planned economies; problems of "collectivist" politics. 3 units. *Lange*

226S. Theories of International Relations. An overview with applications to political-military and political-economic empirical problems. 3 units. *Grieco*

227. International Law. Elements of international law, particularly as interpreted and applied by the United States; rights and duties of states with respect to recognition, state territory and jurisdiction, nationality, diplomatic and consular relations, treaties, treatment of aliens, pacific settlement of disputes, international regulation of the use of force, and collective responsibility. 3 units. *Pye*

229. Recent and Contemporary Political Theory. The rise of positivism and its impact upon modern political thought, the origins of socialism, Marxism and its variants, socialism in the Soviet Union, nationalism, fascism and national socialism, the crisis in modern democracy, Christianity, and the social order. 3 units. *Staff*

233S. Quantitative Political Analysis II. Intermediate statistical methods, especially linear regression, for political science research. Emphasis on assumptions

and interpretations of results. Prerequisite: Political Science 138 or 236 or equivalent. 3 units. *Hoadley*

234S. Political Economy of Development: Theories of Change in the Third World. Alternative approaches to political, economic, and social change in Latin America, Africa, and Asia. (Also listed as Anthropology 234S, History 234S, and Sociology 234S.) 3 units. *Bergquist, Gereffi, Smith, and Valenzuela*

235S. Comparative Development of Islam. Comparative development of Islam in Indonesia, Malaysia, Pakistan, India, North Africa, and sub-Saharan Africa. A comparative analysis of the resurgence of Islam as a religious, political, and cultural force. 3 units. *Braibanti*

236. Statistical Analysis. Introduction to statistics in political research, emphasizing research design, descriptive and inferential statistics, and use of computers. Not open to students who have had or who are enrolled in Political Science 138, Economics 138, Mathematics 53 or 117, Psychology 117, Public Policy Studies 112 or 122, or Sociology 132 or 293. 3 units. *Hoadley*

242S. Comparative Law and Policy: Ethnic Group Relations. (Also listed as Public Policy Studies 242S.) 3 units. *Horowitz*

245. Ethics and Policy Making. (Also listed as Public Policy Studies 223.) 3 units. *Price*

248. The Politics of the Policy Process. (Also listed as Public Policy Studies 219.) 3 units. *Staff*

249. Comparative International Development and Technology Flow. Theoretical analysis of social, political, and economic development in Third World countries. The internal problem of maintaining political systems and the external problem of adapting intermediate or appropriate technologies. 3 units. *Braibanti*

253. Comparative Government and the Study of Latin America. Current literature on major themes of Latin American politics. 3 units. *Valenzuela*

260. The Tradition of Political Inquiry. Past and present problems, goals, presuppositions, and methods. 3 units. *Spragens*

262S. International Communism. 3 units. *Hough*

275. The American Party System. An intensive examination of selected facets of American national political parties, such as relationships between presidential and congressional politics, the politics of national conventions, recent foreign policy and party alignments, and the controversy over party government. 3 units. *Kornberg*

277. Comparative Party Politics. The impact of social and political systems on party structures, functions, ideologies, and leadership recruitment. Emphasis upon research techniques and objectives. 3 units. *Kornberg*

280S. Comparative Government and Politics: Sub-Saharan Africa. Politics and government in selected African states, with particular attention to the problems of decolonization and modernization in the postindependence period. Prerequisite: Political Science 161 or consent of instructor. 3 units. *Johns*

282S. Canada. See course description for History 282S. (Also listed as Anthropology 282S, Economics 282S, and Sociology 282S.) 3 units. *Leach and visitors*

283S. Congressional Policy Making. Lawmaking and oversight of the executive branch by the United States Congress. Committee, party, executive, and interest group roles. (Also listed as Public Policy Studies 283S.) 3 units. *Price*

286S. Judicial Administration. Organization, case processing, and management of courts with emphasis on federal appellate courts. Prerequisite: Political Science 127. 3 units. *Fish*

293. Federalism. Theoretical and operational aspects of federal systems of government, focusing on the United States and Canada. 3 units. *Leach*

For Graduates

302. Departmental Research Seminar. Each participant develops an existing research paper into an article of publishable quality while assisting in the criticism and improvement of other participants' work. Strongly recommended to all Ph.D. students. Not normally open to A.M. students, students in their first semester of graduate work, or students who have taken Political Science 308. 6 units. *Staff*

303. Seminar on Statistics. Application of advanced statistical methods to political science research problems. Primary focus on multiple regression procedures. Emphasis on assumptions, interpretation of results, and use of the computer. Prerequisite: Political Science 236 or consent of instructor. 3 units. *Hoadley*

308. Individual Research. Students will conduct research designed to evaluate hypotheses of their choice. Reports on the research must be presented in appropriate professional style. Normally not open to students who have taken Political Science 302. 3 units. *Staff*

309. Seminar in International Relations. Critical survey of theories and research in international relations and foreign policy. Emphasis will be placed on the interrelation between theory and research. 3 units. *Holsti*

321. Seminar in Political Theory. Prerequisites: 6 units in political science elected from 223, 224, 229, 231, or their equivalents. 3 units. *Spragens*

325. Seminar in Comparative Government and Politics. 3 units. *Staff*

340. Seminar in American Politics and Institutions. Survey, analysis, and critique of the literature. 3 units. *Hoadley or Paletz*

381. Research Seminar in Latin-American Government and Politics. Prerequisite: Political Science 253 or equivalent. 3 units. *Valenzuela*

COURSES CURRENTLY UNSCHEDULED

217S. Economic Theories of Political Behavior

239S. Current Problems of International Law

244S. Administrative Law and Process

246. Administration and Public Policy

285. The Judicial Process

360. Seminar in Government and Politics in the Soviet Union

Related Course Work in the School of Law

There may be graduate credit for course work completed in the Duke University School of Law, under regulations referred to in this bulletin under the section academic regulations in the chapter "Registration and Regulations."

Psychology

Professor Carson, *Chairman* (224 Psychology-Sociology); Associate Professor Eckerman, *Director of Graduate Studies* (225 Psychology-Sociology); Professors Alexander, Bevan, Borstelmann, Costanzo, Diamond, C. Erickson, R. Erickson, Guttman, Kimble, Lakin, Lockhead, H. Schiffman, Staddon, M. Wallach, and Wing; Associate Professors Casseday, Coie, Day, W. G. Hall, W. C. Hall, McConahay,

Roth, and Rubin; Assistant Professors Butzin and Kremen; Adjunct Professors Brodie, Campbell, and Crovitz; Lecturers Clark, Cofer, Cooper, Herman, Keefe, King, Logue, Marsh, Page, Payne, Pinkerton, Pitts, Sawyer, S. Schiffman, Shipley, Somjen, Surwit, Thompson, L. Wallach, Williams, and Wolbarsht

The department offers work leading to the Ph.D. degree. The areas of concentration are experimental, biological, cognitive, personality, developmental, and clinical. A brochure is available from the Director of Graduate Studies which describes the program in more detail and gives information on financial assistance, facilities, and current research activities.

For Seniors and Graduates

202S. Great Ideas in Psychology. A broad range of great ideas in psychology drawn from various content areas, methodological approaches, and time frames. Prerequisite: senior standing. 3 units. *Day*

203S. Sensation and Perception. Classical and current concepts and methods. 3 units. *Lockhead*

210S. Cognitive Psychology. Theoretical and experimental approaches to understanding cognitive processes such as attention, memory, language, problem solving, and thinking. 3 units. *Day, Lockhead, or Rubin*

212S. Human Memory. Literature, classical and modern; data and theories relating to mechanisms of information processing, storage, and retrieval. 3 units. *Rubin*

214S. Development of Social Interaction. Major developments of children's interactions with others (e.g., attachment, social play, aggression, sex-typing, and moral reasoning). Ethological, learning, personality, and cognitive-developmental viewpoints. 3 units. *Eckerman*

215S. Cognitive Development. Major concepts of the development of knowledge in children with particular attention to Piaget. Consideration of educational implications. 3 units. *L. Wallach*

216S. Biological Psychology. The neural basis of behavior with special emphasis on the organization and evolution of the neocortex and the dorsal thalamus. A historical approach is taken using original texts by LeGros Clark, Elliot Smith, Herrick, Sherrington, Cajal, Campbell, and many others. While emphasis is on the neocortical sensory systems, the structure and function of the limbic system and hypothalamus are reviewed. (Also listed as Anatomy 216S.) 3 units. *Diamond*

217S. Social Psychology. Social factors in cognition, models of social interaction, conformity and social influence, and attitude development and change. 3 units. *Costanzo*

219S. Neural Bases of Behavior. Structure and function of the nervous system as related to problems of sensory-motor processes, learning, motivation, and memory. 3 units. *R. Erickson and C. Erickson*

230S. Social Behavior of Animals. Developmental, ecological, and physiological aspects of territorial, sexual, parental, and aggressive behavior. 3 units. *C. Erickson*

234S. Personality. Selected topics of current interest concerning empirical research on personality. Strategies for the definition of research questions and the evaluation of research progress. 3 units. *M. Wallach*

238S. Electroencephalogram and Psychological Function. A survey of experimental and clinical literature on brain wave correlates of intelligence, personal-

ity, behavior disorders, epilepsy, sleep, sensory stimulation, reaction time, and attention. Emphasis on the electrophysiology of conditioning and learning. Lectures, laboratory demonstrations, and clinical case presentations. 3 units. *Marsh*

245S. Personality Theory. Representative theories of human functioning, from Freud to contemporary approaches. 3 units. *Kremen or staff*

260S. Science, Technology, and Society. (Also listed as Sociology 260S.) 3 units. *McKinney*

261S. Science, Politics, and Government. The structure and values of the scientific community, the mechanism and strategies of government, and their mutual interdependence in American society. (Also listed as Political Science 205S, Public Policy Studies 255S, and Sociology 261S.) 3 units. *Staff*

271S. A-F. Selected Problems. 3 units each. *Staff*

272S. Physiology of the Central Nervous System. Prerequisites: Physiology 200 or equivalent, Physiology 270 or equivalent and knowledge of neuroanatomy; for undergraduates, consent of instructor. (Also listed as Physiology 272S.) 2 or 3 units. *Somjen and staff*

273S, 274S. Statistical Principles in Experimental Design. The problems of scientific inference; methods of data analysis and issues in experimental design. 3 units each. *Roth*

283S, 284S. The History of Psychology. 283S: Aristotle to Kant. 284S: development of modern psychology. Prerequisite for 284S: Psychology 283S or consent of instructor. 3 units each. *Guttman*

286S. Psychophysiology of Hearing. Relation of anatomy and physiology to psychophysics of the auditory system. Prerequisite: consent of instructor. 3 units. *Casseday*

295S. Group Psychotherapy and Processes. Past and current trends in group intervention techniques. Field observations. 3 units. *Lakin*

For Graduates

305. Psychopathology. An examination of behavior disorders, with particular emphasis on explanatory concepts and the evidence from research in this field. 3 units. *Carson*

307. Introduction to Methods in Psychotherapy. Current trends in psychotherapeutic practice and research. Application of principles drawn from theories of personality to individual and group psychotherapy. 3 units. *Carson or Lakin*

309. Seminar in Learning. Selected topics in operant conditioning and discrimination learning. 3 units. *Staddon*

310. Seminar in Perception. 3 units. *Lockhead*

318. Methods of Inquiry. Examination of relationships among ideas, methods, and measures in psychological and social research. 3 units. *Costanzo*

319-320. Research Apprenticeship I. Individualized research training with a faculty mentor. 6 units. *Staff*

323, 324. Seminar in Community Psychology. An examination of the organization and functioning of community systems and an exploration of factors involved in system changes through psychologically based intervention strategies. On-line experiences with school system consultation will provide a primary basis for study. 3 units each. *Alexander or Costanzo*

331-332. Research Apprenticeship II. Individualized research training with a faculty mentor. 6 units. *Staff*

335-336. Clinical Inquiry I. Introduction to the process of the assessment of persons, including the study of personal documents, interview data, objective and projective test material, naturalistic observations, and third-party reports. Laboratory sessions involve work with normal human subjects over extended time periods. 6 units. *Alexander and staff*

337. Seminar in Sensory Discrimination. The neural bases of discrimination in vertebrates and invertebrates studied by neurophysiological, electrophysiological, and psychophysical techniques. 3 units. *R. Erickson*

343-344. Clinical Inquiry II. Intensive experience and supervision in clinical intervention processes. Student training in psychotherapy strategies and techniques and in clinical consultation skills is conducted in clinical settings. 6 units. *Staff*

349-350. Practicum in Psychological Research. 6 units. *Staff*

398. Graded Research. 1 to 3 units. *Staff*

399. Special Readings in Psychology. 3 units. *Staff*

COURSES CURRENTLY UNSCHEDULED

253S. Psychological Approaches to Public Policy Analysis

325. Seminar in Animal Behavior

329-330. Proseminar in Psychology

334. Seminar: Behavioral Studies of the Brain

338. Pictorial Representation and Iconic Communication

Public Policy Studies

Associate Professor Behn, *Director* (109C Old Chemistry); Associate Professor Cook, *Associate Director* (223 Old Chemistry); Assistant Professor Devaney, *Director of Graduate Studies* (223 Old Chemistry); Bonnie Bain, *Director of Internship Programs and Placement Services* (122B Old Chemistry); Professors Barber (political science), Blaydon, Eddy, Fleishman (School of Law), Horowitz, Hough (political science), Lange, Pearsall (engineering), Price (political science), and Viscusi (Fuqua School of Business); Associate Professors Clotfelter, Lipscomb, Magat (Fuqua School of Business), McConahay, Stack, and Vaupel; Assistant Professors Entman, Hawes, Kuniholm, and Luger; Professors of the Practice Geller and Yaggy; Lecturer Payne

The graduate program in public policy studies is offered through the Institute of Policy Sciences and Public Affairs. The objective of the program is to prepare students for public sector jobs which require analytical skills and a practical understanding of the processes by which policy is made and implemented.

The A.M. degree requires two academic years and a summer internship. The first year is devoted to core courses in policy analysis, including sequences in quantitative methods, economics, political analysis, and ethics. The summer internship is arranged with a federal or state agency. The second-year curriculum includes course work in public management, a concentration in a substantive policy area, and a masters "memo" to be researched and written on a problem of current policy concern.

Students who are concurrently enrolled in a Ph.D. program or a professional degree program (M.D., J.D., M.B.A., M.H.A., etc.) or who have already obtained

such a degree, can apply for an abbreviated version of the A.M. program. Such students are excused from all the requirements of the second year except for the masters memo, so ordinarily completing the A.M. requirements adds only one year to their graduate programs. Students usually apply for a joint degree program simultaneously with their applications to the graduate departments or professional schools, or during their first or second year of advanced study.

The institute does not award a Ph.D.

More information concerning the A.M. programs can be obtained by writing the Director of Graduate Studies.

For Seniors and Graduates

204S. Ethics in Political Life. (Also listed as Political Science 204S.) 3 units. *Spragens*

207S. Mass Media, Public Opinion, and Public Policy. Reciprocal impacts of the journalistic process and the policy process. Topics include: influence of elites on media content; effect of media messages on the ordinary citizen's perception and evaluation of policy issues; impact of the content and form of media coverage on the options, actions, and frustrations of policy makers. 3 units. *Entman*

215S. Public Policies to Save Lives. Economic, political, legal, and ethical issues in governmental efforts to reduce mortality through various health and safety programs and regulations. 3 units. *Vaupel*

217. Microeconomics and Public Policy Making. Consumption and production theory, welfare economics, theories of collective choice, market structures and regulation, and nonmarket decision making. 3 units. *Clotfelter*

218. Macroeconomic Policy. Survey of macroeconomic theory and analysis of policies designed to reduce unemployment, stimulate economic growth, and stabilize prices. Conventional monetary and fiscal instruments, employment policies, and new policies designed to combat inflation. 3 units. *Luger*

219. The Politics of the Policy Process. The formulation of public policies, substantive policies in a variety of contexts from local government to international affairs; the role of legislatures, interest groups, chief executives, and the bureaucracy in defining alternatives and in shaping policy from agenda formulation to implementation. (Also listed as Political Science 248.) 3 units. *Staff*

221. Analytical Methods I: Decision Analysis for Public Policy Makers. Methods for structuring decision dilemmas and decomposing complex problems, assessing the probabilities of uncertain consequences of alternative decisions, appraising the decision maker's preferences for these consequences and for re-examining the decision. (Not open to students who have taken Public Policy Studies 55.) 3 units. *Staff*

222. Analytical Methods II: Data Analysis for Public Policy Makers. Sampling theory, Bayesian statistics, and regression analysis. Examples from problems in health care, transportation, crime, urban affairs, and politics. (Not open to students who have taken Public Policy Studies 112.) 3 units. *Staff*

223. Ethics and Policy Making. Normative concepts in politics, liberty, justice, the public interest: historical and philosophical roots, relationship to one another and to American political tradition, and implications for domestic policy problems. (Also listed as Political Science 245.) 3 units. *Price*

231. Analytical Methods III: Quantitative Policy Evaluation. Problems in quantifying policy target variables such as unemployment, crime, and poverty. Experimental and nonexperimental methods for evaluating the effect of public programs, including topics in experimental design, regression analysis, and simulation. Prerequisite: Public Policy Studies 222 or equivalent. 3 units. *Staff*

232. Analytical Methods IV: Topics in Economic Policy. Cost benefit analysis of public programs. Public utility regulation, pollution regulation, hospital rate setting, regulation of product safety. Quantitative methods and microeconomic theory for analysis of both normative and positive aspects of economic policy. Prerequisites: Public Policy Studies 110 or 217 or Economics 149 and familiarity with regression analysis or enrollment in Public Policy Studies 231 concurrently. 3 units. *Staff*

236S, 237S. Public Budgeting and Management I and II. 236S: evaluative techniques for improving budget decisions. Administrative concepts for managing public agencies. 237S: emphasis on corporate strategy, leadership and motivation, organizational structure, and cut-back management. Prerequisite for 237S: Public Policy Studies 236S. 3 units each. *Staff*

240S. Analyzing the News. Research seminar on political messages and effects of media. Methodologies and finds of content analysis, survey research, critical theory, semiology; research project integrating these approaches. (Also listed as Political Science 208S.) 3 units. *Entman*

241. Reporting the American People. Critical analysis of the sources of information the media rely upon in reporting opinion and policy preferences: opinion polls, bellwethers, informed elites. Includes the design and execution of a public opinion poll on a topic of local or national interest. 3 units. *McConahay*

242S. Comparative Law and Policy: Ethnic Group Relations. Various approaches to the reduction of conflict in deeply divided societies, primarily in Asia and Africa, with secondary attention to Western countries. The nature of ethnic identity, the sources of group conflict, and the forms and patterns it takes. Methods of analyzing social science materials and utilizing them for the design of policies, laws, and institutions. (Also listed as Political Science 242S.) 3 units. *Horowitz*

250. Public Policy and the Arts. Democratic and aesthetic values in respect to past and present patterns of public support for the arts; for example: subsidies, tax policy, censorship, and the effect of public choices on standards of quality. Visual and performing artists and policy makers from government and business will participate. 3 units. *Payne*

255S. Science, Politics, and Government. (Also listed as Political Science 205S, Psychology 261S, and Sociology 261S.) 3 units. *Staff*

257. United States Policy in the Middle East. From World War II to the present with a focus on current policy options. 3 units. *Kuniholm*

264S. Research Seminar: Topics in Public Policy I. Selected topics. 3 units. *Staff*

268. Federal Tax Policy. Structure, incidence, and economic effects of major federal taxes. Special attention to problems of inflation, income definition, distortions, savings, and investment. (Also listed as Law 518.) 3 units. *Clotfelter*

270S. Humanistic Perspectives on Public Policy. Modes of inquiry into aspects of social life important to policy makers but beyond the normal reach of social science. Reading from James Agee, Robert Coles, Eudora Welty, James Baldwin, George Eliot, and others. Prerequisite: consent of instructor. 3 units. *Payne and Coles*

272. Resource Economics and Policy. (Also listed as Forestry and Environmental Studies 270.) 4 units. *Hyde*

283S. Congressional Policy Making. (Also listed as Political Science 283S.) 3 units. *Price*

For Graduates

303. Public Policy Workshop I. Modules on math, computer programming, and written and oral communication skills. Open to Public Policy Studies A.M. students only. 3 units. *Staff*

304.01. Public Policy Workshop II. The role and influence of policy analysis. The examination of specific public policy cases and recommendations for action. Emphasis on written and oral communications skills. 3 units. *Staff*

305.01. Public Policy Workshop III. Research for local and state clients in public agencies. Open to Public Policy Studies A.M. students only. 3 units. *Staff*

387. Research Tutorial in Public Policy. 3 units. *Staff*

388. Research Tutorial in Public Policy. 3 units. *Staff*

399. Special Readings in Public Policy Studies. 3 units. *Staff*

COURSES CURRENTLY UNSCHEDULED

206S. Contemporary Social Journalism

224. Applications of Administrative and Organizational Theory

252S. National Security Policy

253S. Psychological Approaches to Public Policy

254. Transportation Planning and Policy Analysis

256. The Economics of Health Care

260S. Research Seminar: The Administration of Justice

261S. Research Seminar: Health Policy

262S. Communication Policy and the Law

266. The Politics of Health Finance and Regulation

273S. The Uses of History in Public Policy II

276S. National Policies and the Family

Religion

Associate Professor Bland, *Chairman* (117B Gray); Professor E. Meyers, *Director of Graduate Studies* (209A Divinity School); Professors Beach, Bradley, Clark, Henry, Herzog, Kort, Lacy, Langford, Lawrence, Lincoln, Long, Murphy, Osborn, Poteat, Price, D. M. Smith, H. Smith, Steinmetz, Wintermute, and Young; Associate Professors Bailey, Charlesworth, Corless, Gregg, and Partin; Assistant Professor C. Meyers; Research Professor Emeritus Cushman

The Department of Religion offers graduate work leading to the A.M. and Ph.D. degrees. Students may major in one of seven fields: (1) Old Testament and Semitic studies, (2) New Testament and Christian origins, (3) history of Christianity, (4) Christian theology and ethics, (5) history of Judaism, (6) history of religions, and (7) religion and culture. They will be expected to take courses which will contribute to an adequate understanding of their chosen fields of specialization and will be required to take two written preliminary examinations within their field of concentration.

In addition to course work in their major field, students will take such other courses in cognate fields as will contribute to the enrichment of their major studies

and will be required to take one written preliminary examination in a single cognate area within the department. A minor requirement may be fulfilled by work in a cognate department, such as classical studies, history, philosophy, political science, or sociology, and will constitute the outside minor and material for a fourth written preliminary examination. There is, in addition, an oral examination conducted by the student's committee immediately subsequent to the written examinations.

The program of doctoral studies presumes a foundation in the academic study of religion. Students applying for graduate work in religion directly from an undergraduate program should have had a strong undergraduate major in religion, and will be accepted for the Ph.D. program only upon the satisfactory completion of the A.M. degree with the department.

The graduate program also offers an A.M. degree that is not linked to a specific Ph.D. field. Such study is intended to encourage individuals to pursue a variety of interests irrespective of whether they desire further graduate study. An A.M. concentration may be in any of the seven Ph.D. fields or in an individually designed program of study (such as Islamic studies or religion and the social sciences).

For Seniors and Graduates

207, 208. Intermediate Biblical Hebrew. Grammar with reading and exegesis of Old Testament prose and poetry. Prerequisite: at least one year of Hebrew or consent of instructor. (Also listed as Old Testament 207-208 in the Divinity School.) 6 units. *Staff*

209. Old Testament Theology. Studies of the Old Testament in regard to theological themes and content. 3 units. *Murphy*

210. Contemporary British Theology. Selected problems in representative British theological writings after 1900. 3 units. *Langford*

217. Islam in India. History and thought of major Indian Muslims from Biruni to Wali-Ullah, with special attention to the role of Sufism. An introduction to selected Muslim scholars and saints who contributed to the interaction between Islam and Hinduism in northern India during the second millennium A.D. 3 units. *Lawrence*

218. Religion in Japan. A survey of religion in Japan, with special emphasis on indigenization and attempts at synthesis. An approach to the meaning of the words *religious* and *secular* in the Japanese situation. 3 units. *Corless*

219. Augustine. The religion of the Bishop of Hippo in late antiquity. (Also listed under Medieval and Renaissance Studies.) 3 units. *Gregg*

220. Rabbinic Hebrew. Interpretive study of late Hebrew, with readings from the Mishnah and Jewish liturgy. 3 units. *E. Meyers or staff*

221. Readings in Hebrew Biblical Commentaries. Selected Hebrew texts in Midrash Aggadah and other Hebrew commentaries reflecting major trends of classical Jewish exegesis. 3 units. *Bland or staff*

223A-E. Exegesis of the Hebrew Old Testament. Interpretation based upon Hebrew exegesis, stress upon hermeneutic methods. 3 units each.

A. Amos and Hosea. *Bailey*

B. Job. *Murphy*

C. I Samuel. *Bailey*

D. Song of Songs. *Murphy*

E. Ecclesiastes. *Murphy*

- 225. Living Issues in New Testament Theology.** Critical examination of major problems and issues in New Testament interpretation and theology. 3 units.
D. M. Smith
- 226A-F. Exegesis of the Greek New Testament I.** 3 units each.
A. Mark and Matthew. *Price or D. M. Smith*
B. Romans. *Price*
E. The Gospel and Epistles of John. *D. M. Smith*
F. I and II Corinthians. *Price or D. M. Smith*
- 227A-C. Exegesis of the Greek New Testament II.** 3 units each.
A. Luke-Acts. *Young*
B. Galatians. *D. M. Smith*
C. The Pastoral Epistles. *Young*
- 228. Twentieth-Century Continental Theology.** An investigation of leading theologians and theological trends. 3 units. *Osborn*
- 230S. The Meaning of Religious Language.** An analysis of the credentials of some typical claims of theism in the light of theories of meaning in recent thought. (Also listed as Philosophy 230S.) 3 units. *Poteat*
- 231. Seminar in Religion and Contemporary Thought.** Analytical reading and discussion of such critical cultural analysis as is found in the works of Polanyi, Arendt, Trilling, and others, with appraisal of the relevance of theological inquiry. 3 units. *Poteat*
- 233. Modern Narratives and Religious Meanings.** A study of kinds of religious meaning or significance in representative American, British, and Continental fiction of the first half of the twentieth century. 3 units. *Kort*
- 236. Luther and the Reformation in Germany.** The theology of Martin Luther in the context of competing visions of reform. (Also listed under Medieval and Renaissance Studies.) 3 units. *Steinmetz*
- 239. Introduction to Middle Egyptian.** Grammar and readings in hieroglyphic texts relating to the Old Testament. 3 units. *Wintermute*
- 241. Problems in Reformation Theology.** (Also listed under Medieval and Renaissance Studies.) 3 units. *Steinmetz*
- 244. The Archaeology of Palestine in Hellenistic-Roman Times.** The study of material and epigraphic remains as they relate to Judaism in Hellenistic-Roman times, with special emphasis on Jewish art. Prerequisite: reading knowledge of a biblical language. 3 units. *C. Meyers or E. Meyers*
- 245. Ethics in World Religions.** Moral foundations, assumptions, and applications in such major faiths as Hinduism, Buddhism, Confucianism, and Islam, in the light of Christian ethical perspectives. 3 units. *Lacy*
- 246. Problems in Historical Theology.** Prerequisite: consent of instructor. 3 units. *Staff*
- 258. Coptic.** Introduction to the Sahidic dialect with selected readings from Christian and Gnostic texts. Prerequisite: at least one year of Greek. 3 units. *Wintermute*
- 262. Marxist Ideology and Christian Faith.** Comparative examination of Communist and Christian doctrines concerning humans, society, sin, history, and eschatology, together with an introduction to the contemporary dialogue. 3 units. *Lacy*
- 281. Phenomenology and Religion.** Scheler, E. Strauss, Merleau-Ponty, Ricoeur, Binswanger, or others; their bearing upon religious knowledge and practice. Prerequisite: consent of instructor. 3 units. *Poteat*

283. Islam and Modernism. Cultural, religious, and ideological forces which shape Muslim responses to modernism. 3 units. *Lawrence*

284. The Religion and History of Islam. Origins and development of the Islamic community and tradition, with particular attention to the religious element. 3 units. *Partin*

285. Introduction to the History of Religions. The history, symbols, rites, and structures of the manifestations of the sacred in the major religious traditions of the world. 3 units. *Staff*

287. The Scriptures of Asia. Translations of basic texts from the religious traditions of India, China, and Japan. 3 units. *Bradley*

288. Buddhist Thought and Practice. A historical introduction to Buddhist thought and practice, with special attention to their interrelationship in the living religion. 3 units. *Corless*

290. Current Problems in Christian Social Ethics. A critical study of secularization, the technological revolution, and the ecological crisis. 3 units. *Beach*

291. Historical Forms of Protestant Ethics. A survey of major types of Protestant ethical theory from Luther through contemporary figures. 3 units. *Beach*

296. Religion on the American Frontier. A study of the spread of evangelical Christianity as a theological and cultural phenomenon of the American West. 3 units. *Henry*

For Graduates

302. Studies in the Intertestamental Literature. Selected documents of the Apocrypha and Pseudepigrapha examined exegetically and theologically in their relation to postexilic Judaism. Prerequisite: consent of instructor. 3 units. *Charlesworth*

304. Aramaic. A study of the Aramaic portions of the Old Testament and selected passages from the Elephantine and Qumran texts. 3 units. *E. Meyers or Wintermute*

306. Language and Literature of the Dead Sea Scrolls. A study in interpretation. Prerequisite: a knowledge of Hebrew. 3 units. *Charlesworth*

307. Syriac. A study of the script and grammar, with readings from the Syriac New Testament and other early Christian documents. Prerequisite: some knowledge of Hebrew and Aramaic. 3 units. *Charlesworth*

308. Greek Patristic Texts. Critical translation and study of selected Greek texts illustrative of significant aspects of patristic theology and history from the second through the fifth century A.D. 3 units. *Young*

310. Readings in Judaica. Selected studies in Jewish material culture and problems in Jewish religious and intellectual history. 3 units. *Bland, E. Meyers, and staff*

318. Seminar in the Greek Fathers. A study of selected topics from the Greek Fathers. 3 units. *Young or Gregg*

320. Theology, Power, and Justice. Critical examination of a major theme of modern Protestant thought in Hegel, Marx, Schleiermacher, and Tillich. 3 units. *Herzog*

322. Nineteenth-Century European Theology. Protestant theology from Kant to Herrmann. 3 units. *Herzog*

323A. Comparative Semitic I. An introduction to the morphology and syntax of classical Ethiopic and the Semitic languages of Mesopotamia, together with a consideration of their relationship to Hebrew. 3 units. *Wintermute*

323B. Comparative Semitic II. An introduction to the morphology and syntax of classical Arabic and the Semitic languages of Palestine-Syria, together with a consideration of their relationship to Hebrew. 3 units. *Wintermute*

324. Readings in the History of Religion. An examination of the theories, methods, and purposes of the study of non-Western religions within the Western tradition. 3 units. *Long*

325. Philosophical Theology I. Theology, as the knowledge of God, considered in dialogue with selected pagan and Christian philosophers from Plato to Kant. 3 units. *Staff*

326. Philosophical Theology II. 3 units. *Staff*

328. Twentieth-Century European Theology. Critical examination of the thought of selected Protestant theologians from 1900 to 1950. 3 units. *Herzog*

337. Theology of St. Thomas Aquinas. Intensive reading of the *Summa Theologica* and biblical commentaries. 3 units. *Staff*

338. Calvin and the Reformed Tradition. The theological development of John Calvin. A comprehensive examination of his mature position with constant reference to the theology of other reformers. (Also listed under Medieval and Renaissance Studies.) 3 units. *Steinmetz*

340-341. Seminar in the New Testament. Research and discussion on a selected problem in the biblical field. Spring only. 3 units each. *Staff*

350-351. Old Testament Seminar. Research and discussion on selected problems in the Old Testament and related fields. Fall only. 3 units each. *Staff*

352. Seminar in Christian Theology. Research and discussion of a selected problem in the systematic field. 3 units. *Staff*

353. Seminar on Text Criticism. Emphasis upon transmission, versions, apparatus, and method. Prerequisite: reading knowledge of Hebrew and Greek. 3 units. *Bailey*

360. Special Problems in Religion and Culture. Intensive investigation of the relations of religion and modernity, using seminal contemporary texts. Topics announced each semester. Prerequisite: consent of instructor. 3 units. *Poteat*

370. Seminar in Religion and Literature. Analysis and discussion of theories and of individual research projects. 3 units. *Kort*

373-374. Elementary Akkadian. Study of the elements of Akkadian grammar. Reading of neo-Assyrian texts shedding light on the Old Testament. Prerequisite: biblical Hebrew. 6 units. *Bailey*

377. Contemporary American Dramatic Arts and Evolving Theological Forms. An examination of creed and ritual implicit and explicit in contemporary American theater, film, and television. 3 units. *Henry*

380. Existentialist Thought. An exploration of the interests and motifs of existentialism in relation to modern philosophy and theology through an analysis of representative writings of Kierkegaard, Heidegger, Berdyaev, Marcel, and Sartre. 3 units. *Poteat*

383. Moral Theology in the Twentieth Century. Critical and comparative examination of ethical theory as exhibited in the work of selected contemporary theologians. 3 units. *H. Smith*

384. Religious Dissent in American Culture. History and significance of dissent in the theology and culture of America. 3 units. *Henry*

385. Religion in American Literature. A critical study of the meaning and value of religious motifs reflected in American literature. 3 units. *Henry*

386. Christianity in Dialogue with Other Faiths. Contemporary currents of Christian thought as they affect resurgent non-Christian faiths, new formulations of a theology of mission, and ecumenical conversations. 3 units. *Lacy*

389. Christian Ethics and Contemporary Culture. A study of the interaction between Christian thought and current social theory. 3 units. *Beach*

395. Christian Thought in Colonial America. Exposition of the main currents in Protestant theology. 3 units. *Henry*

396. Liberal Traditions in American Theology. A study of the main types of modern religious thought, beginning with the theology of the Enlightenment. 3 units. *Henry*

COURSES CURRENTLY UNSCHEDULED

204. Origen

206. Christian Mysticism in the Middle Ages

237. History of the Ancient Near East

238. Jewish Responses to Christianity

242. Life after Death in Semitic Thought

243. Archaeology of Palestine in Biblical Times

247. Readings in Latin Theological Literature

248. The Theology of Karl Barth

251. Counter-Reformation and Development of Catholic Dogma

252. Nineteenth-and Twentieth-Century Roman Catholic Theology

255. Seminar in African Religions

264. The Sociology of the Black Church

265. The Religions of the West Africa Diaspora

280. The History of Religions

300. Systematic Theology

301. Seminar in Contemporary Christian Ethics

304A. Targumic Aramaic

311. Pharisaic Judaism in the First Century

312. Pauline Theology

313. The Apostolic Fathers

314. Judaism and Christianity in the New Testament

315-316. Seminar: History of Religions

317. Seminar in the Greek Apologists

319. The Gospel According to Saint Matthew in Recent Research

327. Philosophical Method in Religious Studies

- 334. Theology and Reform in the Later Middle Ages
- 335. The English Church in the Eighteenth Century
- 339. The Radical Reformation
- 344. Zwingli and the Origins of Reformed Theology
- 387. Ethical Method
- 388. Ethics and Medicine
- 394. Christianity and the State
- 397. Contemporary American Theology
- 398. Colloquium on the Teaching of Religion
- 401. Colloquium on Biblical Studies

Romance Languages

Professor Stewart, *Chairman and Director of Graduate Studies* (205 Languages); Professors Cordle, Fein, Osuna, Tetel, and Wardropper; Associate Professors Caserta, Garci-Gómez, Hull, Orr, and Thomas; Assistant Professor Pérez

The Department of Romance Languages offers graduate work leading to the A.M. and Ph.D. degrees in French and Spanish. Requirements for the A.M. may be completed by submission of a thesis or by passing a comprehensive examination in the major field. Related work for the A.M. and Ph.D. degrees is required in a second Romance language or in any one or two of a number of other subject areas.

In order to undertake graduate study in Romance languages, the entering student should have credit for at least 18 semester hours (or equivalent) above the intermediate level in the major language.

FRENCH

For Seniors and Graduates

210. The Structure of French. Modern French phonology, morphology, and syntax. Readings in current linguistic theory. 3 units. *Hull*

211. History of the French Language. The evolution of French from Latin to its present form; internal developments and external influences. (Also listed under Medieval and Renaissance Studies.) 3 units. *Hull*

223. Semiotics for Literature. A study of theoretical writings in general semiotics by Frege, Peirce, Saussure, Mukarovsky, Morris, and their applications for textual analysis of French literary works by representative contemporary critics such as Eco, Riffaterre, Corti, and Greimas. In English. 3 units. *Thomas*

248. French Literature of the Seventeenth Century. The baroque and the classical: form and meaning in the plays of Corneille, Racine, and Molière. Readings in baroque and précieux poetry. (Also listed under Medieval and Renaissance Studies.) 3 units. *Staff*

251, 252. Literature of the Eighteenth Century. Problems of literary history, critical reading, and interpretation, focused on varying topics. 6 units. *Stewart*

255. French Preromantic and Romantic Poetry. Chénier, Vigny, Lamartine, Musset, Hugo, and Nerval. 3 units. *Orr*

256. Modern Literature and History. The problems of history, society, and politics in literature, through the writings of Rousseau, Tocqueville, Michelet, Flaubert, Hugo, Merleau-Ponty, Foucault, and others. 3 units. *Orr*

257, 258. The Nineteenth-Century French Novel. 257: romanticism and romantic realism, studies especially in the works of Chateaubriand, Stendhal, and Balzac. 258: realism and naturalism, with special emphasis on Flaubert and Zola. 6 units. *Staff*

263. Contemporary French Theater. Dramatic theory; the art of the leading directors; and the major texts of Claudel, Giraudoux, Anouilh, Sartre, Beckett, Ionesco, and Genet. 3 units. *Cordle*

265, 266. French Literature of the Twentieth Century. 265: to 1935, emphasis on Gide, Mauriac, and Malraux. 266: after 1935, emphasis on Sartre, Camus, and the *nouveau roman*. 6 units. *Cordle*

290S. Studies in a Contemporary Figure. A writer, philosopher, critic, or artist. 3 units. *Staff*

For Graduates

325. French Prose of the Sixteenth Century. Rabelais, Marguerite de Navarre, Montaigne, and others. (Also listed under Medieval and Renaissance Studies.) 3 units. *Tetel*

326. Topics in Renaissance Poetry. (Also listed under Medieval and Renaissance Studies.) 3 units. *Tetel*

391, 392. French Seminar. 3 units. *Cordle, Orr, Stewart, Tetel, and Thomas*

Graduate Reading Course. An intensive course in French to develop rapidly the ability to read French in several fields. Graduate students only. No credit.

Courses Currently Unscheduled

240. Old French Literature

261. French Symbolism

264. Proust

ITALIAN

For Seniors and Graduates

283. Italian Novel of the Novecento. Representative novelists from Svevo to the most recent writers. 3 units. *Caserta*

284. Dante. *La Vita Nuova* and a close reading of the *Inferno*. Conducted in English. (Also listed under Medieval and Renaissance Studies.) 3 units. *Caserta*

285. Dante. The *Purgatorio* and the *Paradiso* in the light of Dante's cultural world. Special attention will be given to the poetic significance of the *Commedia*. Prerequisite: Italian 284 or equivalent. (Also listed under Medieval and Renaissance Studies.) 3 units. *Caserta*

SPANISH

For Seniors and Graduates

210. History of the Spanish Language. Formation and development of Spanish: internal forces and external contributions. (Also listed under Medieval and Renaissance Studies.) 3 units. *Garci-Gómez*

245, 246. Modern and Contemporary Spanish American Literature. 245: poetry from *modernismo* to the present. 246: twentieth-century fiction. 3 units each. *Fein and Pérez*

251. The Origins of Spanish Prose Fiction. Selected examples of the romance and the novel: *Amadís de Gaula*, Diego de San Pedro's *La Cárcel de amor*, the *Abencerraje*, the *Lazarillo*, Montemajor's *Diana*. (Also listed under Medieval and Renaissance Studies.) 3 units. *Wardropper*

253. Cervantes. The life and works of Cervantes, with special emphasis on his *Quijote*. (Also listed under Medieval and Renaissance Studies.) 3 units. *Wardropper*

254. Drama of the Golden Age. Study of the chief Spanish dramatists of the seventeenth century with readings of representative plays of this period. (Also listed under Medieval and Renaissance Studies.) 3 units. *Wardropper*

258S. Spanish Lyric Poetry before 1700. A critical study, based on close reading and discussion, of selected poems of the Middle Ages, Renaissance, and baroque. Special emphasis on the *Razón de amor*, la *Poesía de tipo tradicional*, and Santillana; on Garcilaso, San Juan de la Cruz, Fray Luis de León, and Herrera; on Góngora and Quevedo. (Also listed under Medieval and Renaissance Studies.) 3 units. *Wardropper*

275. Modern Spanish Poetry. Juan Ramón Jiménez, Unamuno, Antonio Machado, the Generation of 1927, and the contemporary poets. 3 units. *Osuna*

276. Modern Spanish Drama. The theater of Benavente, Valle-Inclán, Lorca, Casona, Buero Vallejo, Sastre, and Arrabal. 3 units. *Osuna*

277. Modern Spanish Novel. From the Generation of 1898 to the present. 3 units. *Osuna*

Courses Currently Unscheduled

391, 392. Hispanic Seminar

ROMANCE LANGUAGES

218. The Teaching of Romance Languages. Evaluation of objectives and methods; practical problems of language teaching at the elementary, secondary, and college levels; analysis of textbooks, texts, and audiovisual aids; applied linguistics. 3 units. *Hull*

Slavic Languages and Literatures

Professor Krynski, *Chairman* (314 Languages); Associate Professor Jezierski

The Department of Slavic Languages and Literatures offers graduate courses in Russian language and literature and limited training in the language and literature of Poland.

Students should have sufficient preparation in the Russian language to enable them to read Russian classical literature in the original. Any presently unscheduled course will be taught in any semester upon request.

For Seniors and Graduates

201, 202. Russian Novel of the Nineteenth Century. 201: 1830 to 1870. 202: 1870 to 1900. Prerequisites: Russian 161 and 162 or equivalents. 6 units. *Krynski*

225S. Tolstoy. *War and Peace* and other works. Prerequisite: Russian 175S or equivalent. 3 units. *Jezierski*

232. Dostoevsky. Emphasis on *Brothers Karamazov* and the theory of the novel. Prerequisite: Russian 176 or equivalent. 3 units. *Jezierski*

COURSES CURRENTLY UNSCHEDULED

230. Chekhov

Sociology

Professor Kerckhoff, *Chairman* (268 Sociology-Psychology); Professor Smith, *Director of Graduate Studies* (332 Sociology-Psychology); Professors Back, McKinney, Maddox, Myers, Palmore, Preiss, Simpson, and Tiryakian; Associate Professors Campbell and Wilson; Assistant Professors Brown, Gereffi, O'Rand, and Stark; Adjunct Associate Professors George and Manton

The department offers graduate work leading to the A.M. and Ph.D. degrees in sociology. Students beginning work toward an advanced degree should have completed a minimum of 12 semester hours of acceptable courses in sociology and an additional 12 semester hours in related work (e.g., other social sciences, statistics, computer science, philosophy, mathematics). Accepted applicants who have not had such preparation may be required to take work beyond the usual program requirements. Applicants for admission are required to take the verbal and quantitative aptitude tests of the Graduate Record Examination.

The department concentrates its Ph.D. training in two programs: life course analysis, and changing world societies. Each program has its own two-core course requirement, but all share a six-course requirement covering theory (280, 281), methodology and research methods (296, 297), and statistics (293, 294). In addition, each program has an informal seminar series and expects student involvement in related research activities. In order to assure some breadth of training, all students are required to take at least four departmental courses outside the specific course requirements of both their chosen program and the departmental core requirements. Two additional courses outside the department in related work are also required, for a total of fifteen courses beyond the bachelor's degree.

There is a qualifying procedure after three semesters, or equivalent, to determine whether the student can proceed to the preliminary examination which consists of two four-hour written examinations and a two-hour oral examination covering the core curriculum and the program area chosen by the student. Further details concerning the general departmental program, the specialized programs, departmental facilities, the staff, ongoing research, and various stipends available may be obtained from the Director of Graduate Studies.

For Seniors and Graduates

201S. Social Change. Comparisons of alternative theoretical schools of social change and societal transformations: functional, evolutionary, conflict, Marxist, dependency, and world systems perspectives. 3 units. *Brown, Gereffi, or Tiryakian*

202S. Social Organization. Alternative theoretical perspectives of the bases of social structure: Marxist, exchange, and functionalist. The study of social groups from primary associations to organizations and to community. Processes of differentiation, hierarchy, and conflict. 3 units. *O'Rand, Simpson, Smith, or Wilson*

210. Comparative Race and Ethnic Relations. Classical theories and current research on racial and ethnic inequality in the United States and in other countries. 3 units. *Staff*

225. Medical Sociology. Current issues in the organization, development, and the utilization of resources for health care. 3 units. *Back or Maddox*

230. Social Aspects of Aging and Death. Theories of human aging; social problems caused by increased longevity, discrimination against the aged, retirement, widowhood, and other role losses. Social-psychological factors in mortality, accidental death, suicide, and murder. 3 units. *Palmore or O'Rand*

233S. Culture, Religion, and Modernity. The role of ideas and ideology in the process of social change. The origins and development of modernity in Western and non-Western societies. Patterns of religious expression and cultural integration. 3 units. *Tiryakian*

234S. Political Economy of Development: Theories of Change in the Third World. See course description for Political Science 234S. (Also listed as Anthropology 234S and History 234S.) 3 units. *Berquist, Gereffi, Smith, and Valenzuela*

241. Social Stratification. The nature of hierarchical and vertical differentiation for the economic, political, and prestige structures in modern societies. The interrelationship of class, status, and power strata and their influence on social institutions, personality structure, and group and individual behavior. The transmission of inequality from one generation to the next. 3 units. *Campbell or O'Rand*

243. Population Dynamics and Social Change. Social scientific aspects of the determinants and consequences of population trends. 3 units. *Myers*

260S. Science, Technology, and Society. Science as a social phenomenon. Relationship of science to technology and their articulation through public policy. Interaction of the institutions of science with other societal institutions. 3 units. (Also listed as Psychology 260S.) *McKinney*

261S. Science, Politics, and Government. See course description for Psychology 261S. (Also listed as Political Science 205S and Public Policy Studies 255S.) 3 units. *Staff*

276S. Social Structure and the Life Course. The organization of education, career sequences, cohort patterns, and role definitions, adolescence, old age, and retirement; variations by race and sex. 3 units. *Campbell, Maddox, or O'Rand*

277S. Social Patterns of Personal Development. The effects of the family, school, work, and other institutional settings on the individual. 3 units. *Kerckhoff, O'Rand, or Preiss*

279S. Social Psychology. Study of group structure and processes. Dynamic relations within and between groups and the links between groups and societies. 3 units. *Back or Preiss*

280S. Contemporary Sociological Theory. An analysis of the structure and foundations of recent formulations of such theoretical approaches as phenomenological sociology, exchange theory, critical theory, structuralism, neo-Marxist sociology, sociobiology, and action theory. 3 units. *Tiryakian or Wilson*

281S. Development of Sociological Theory. Sociological thought from Comte to contemporary theorists, with particular focus on Parsons and the Parsonian School. The societal and institutional context of the development of sociological theory and paradigms. 3 units. *Tiryakian or Wilson*

282S. Seminar on Canada. See course description for History 282S. (Also listed as Anthropology 282S, Economics 282S, and Political Science 282S.) 3 units. *Staff and visitors*

293. Introductory Statistical Analysis. Basic descriptive statistics, regression and correlation, *t*-tests and the analysis of variance, chi square techniques, and other topics. Stress on practical applications. Statistical computing using SPSS and other programs. 3 units. *Campbell*

294. Intermediate Statistical Analysis. The general linear model and its application in methods of multivariate statistical analysis: analysis of variance and covariance, multiple regression and path analysis, and log-linear models for categorical data. Statistical computing using SPSS and other programs. Prerequisite: Sociology 293 or equivalent. 3 units. *Campbell*

296S. Research Methods and Methodology. Presuppositions and basic questions in the methodology of social scientific research. Alternative research designs and the assumptions and methods of analysis. 3 units. *Back, Campbell, or Smith*

297S. Data Collection and Analysis. Survey of methods of sociological data collection: observation, experiments, surveys, and historical studies. Issues in the analysis of data: organizing data, coding, indexes, descriptive and analytic measures. Problems of interpretation, verification, and dissemination of research results. 3 units. *Back, Campbell, or Smith*

298S, 299S. Seminar in Selected Topics. Substantive, theoretical, or methodological topics. 3 units each. *Staff*

COURSES CURRENTLY UNSCHEDULED

205S. Complex Organizations

242. The Sociology of Occupations and Professions

244. Human Ecology and Urban Systems

295. Methodology in Sociology

301. Seminar in Human Fertility

302. Seminar in Migration

325. Social Aspects of Mental Illness and Treatment

345, 346. Demographic Techniques I and II

349, 350. Seminar in Selected Topics of Demography and Ecology

373, 374. Social Psychological Issues in Sociology

385. Seminar in Sociological Theory

386. Seminar in Sociological Theory

390. Seminar in Field Methods of Sociological Research

392. Individual Research in Sociology

397, 398. Seminar in Special Research

The University Program in Toxicology

Associate Professor Lynn, *Director* (133 Jones Building); Associate Professor Abou-Donia, *Deputy Director* (020 Research Park IV); Associate Professor Graham, *Deputy Director* (M207 Davison Building); Associate Professor Richardson, *Deputy Director* (004A Biological Sciences Building)

The University Program in Toxicology seeks to produce individuals with sound training in the scientific basis for research in toxicology who will advance the science of this discipline. After broad general courses in epidemiology and statistics, pathology, and mammalian toxicology, students will be trained in one of three tracks: (1) as generalist toxicologists, with broad training in the principles and concepts of toxicology and the design of protocols for toxicological assessments; (2) as specialist toxicologists in those areas of toxicology research in which faculty members are currently productive—pulmonary toxicology, neurotoxicology, immunotoxicology, genetic toxicology (carcinogenesis), and biochemical toxicology; or (3) as ecotoxicologists with broad training in principles and concepts of both toxicology and ecology as they relate to the release, transport, exposure, accumulation, and the effects of toxics in the ecosystems.

The toxicology program faculty is comprised of members from the Departments of Anatomy, Biochemistry, Chemistry, Forestry and Environmental Studies,

Microbiology and Immunology, Pathology, Pharmacology, Physiology, Zoology, and several departments in the School of Medicine.

Students seeking the Ph.D. in one of the participating Graduate School departments may make initial application to either the program or one of the departments. All who apply directly to the program will be considered for admission by the program and the department of the student's choice. Students who apply initially for graduate study in one of the departments may also be nominated by that department for admission to the program. It is expected that most students will have a strong undergraduate preparation in mathematics and the physical and biological sciences with demonstrated excellence of performance as judged by grades in course work and letters of recommendation from former instructors.

All students in the program will take a series of courses in toxicology as well as courses specified by his or her department. A student will be expected to choose a dissertation adviser in his or her department at least by the end of the first two semesters in the program, and will normally be expected to begin dissertation research during the third semester in residence. Upon satisfactorily completing all degree requirements in the program and in the department, students will be jointly recommended for the Ph.D. degree.

Further information may be obtained from the Director of the toxicology program (Department of Biochemistry).

Zoology

Professor Wainwright, *Chairman* (227 Biological Sciences); Professor Wilbur, *Director of Graduate Studies* (129 Biological Sciences); Professors Barber, Costlow, Fluke, Gillham, Gregg, Klopfer, Livingstone, Nicklas, Schmidt-Nielsen, Staddon, Tucker, Vogel, and Ward; Associate Professors Forward, Lundberg, McClay, H. Nijhout, and Sutherland; Assistant Professors Conner, M. Nijhout, Rausher, and Uyenoyama; Adjunct Professor Schmidt-Koenig

The Department of Zoology manages a variety of programs tailored to individual needs of students seeking the Ph.D. degree. The A.M. degree may be taken by students en route to the Ph.D., or by those who leave the doctoral program. Ordinarily, only students seeking the doctorate are admitted to the department.

In general, students entering the department will be equipped to pursue advanced degrees if they have completed an undergraduate major in biology along with some formal training in college level chemistry, mathematics, physics, and foreign languages.

Nevertheless, in recognition and support of the modern trend toward interdisciplinary research, the department is prepared to accept promising students with less orthodox academic backgrounds and is ready to encourage any student wishing to undertake a program of study leading, in effect, to an interdisciplinary degree sponsored by the department.

Thus, all students are urged to search widely in both the *Bulletin of Duke University: Undergraduate Instruction* and the *Bulletin of Duke University: Graduate School* for information about the intellectual resources of the University. Special attention should be given to announcements of the Departments of Anatomy, Anthropology, Biochemistry, Botany, Chemistry, Geology, History, Mathematics, Microbiology and Immunology, Pharmacology, Philosophy, Physiology, Psychology, Sociology, and Zoology; announcements of the Schools of Engineering and Forestry and Environmental Studies should also be consulted.

For Seniors and Graduates

The L suffix on a zoology course number indicates that the course includes a laboratory.

201L. Animal Behavior. Physiological and developmental studies. Laboratory emphasizes research projects. Prerequisites: physiology and genetics or consent of instructor; evolution recommended. 4 units. *Klopfer*

203L. Marine Ecology. Application of ecological theory to marine systems. Mathematical properties of population growth and species interactions; field and laboratory projects with computer-assisted analysis of data. Practice in scientific writing. Readings from current scientific publications. Prerequisites: introductory biology or invertebrate zoology and calculus; knowledge of statistics recommended. Offered at Beaufort. (Also listed as Marine Sciences 203L.) 6 units. *Sutherland*

204L. Community Ecology. Theoretical approach to competition, predation, food webs, and species diversity. Laboratories emphasize biometrical design and analysis of experimental field studies. Individual projects and weekend field trips. Prerequisites: Zoology 103L and calculus and consent of instructor. 4 units. *Wilbur*

215L. Primary Productivity in the Seas. Prerequisites: introductory biology and chemistry. Offered at Beaufort. (Also listed as Botany 215L.) 4 units. *Barber and Ramus*

216L. Limnology. Lakes, ponds, and streams: their origin, development, geochemistry, energy balance, productivity, and the dynamics of plant and animal communities. Laboratory includes field trips. Offered biennially. Prerequisites: introductory biology and Chemistry 12 and physics and Mathematics 32 or consent of instructor. 4 units. *Livingstone*

222L. Entomology. The biology of insects: diversity, development, physiology, and ecology. Field trips. Prerequisite: introductory biology. 4 units. *H. Nijhout*

226L. Ichthyology. Diversity, evolution, natural history, and ecology of fishes. Laboratory includes overnight field trips to marine and freshwater habitats. Prerequisites: introductory biology and Zoology 108L or equivalent. 3 units. *Lundberg*

229. Morphogenetic Systems. Introduction to the experimental study of development. Gametogenesis and fertilization, formation of primary axes, interactions of nucleus and cytoplasm, morphogenetic movements, embryonic induction, regeneration, energetics. Prerequisite: introductory biology. 3 units. *Gregg*

233. Principles of Insect Behavior. Processes governing the behavior of animals as illustrated by insects. Neural integration, communication, genetics, ecology, and evolution of individual and social behavior. Invertebrate zoology or entomology recommended. 3 units. *Conner and Rausher*

237L. Systematic Biology. Theory and practice of identification, species discovery, phylogeny reconstruction, classification, and nomenclature. Prerequisites: introductory biology and one course in animal or plant diversity. 3 units. *Lundberg*

244. Principles of Immunology. (Also listed as Microbiology and Immunology 244.) 3 units. *McClay and Whisnant (microbiology and immunology)*

247S. Photobiology. Effects of visible light and of ultraviolet and near ultraviolet radiation in living systems: repair processes, quantum processes, physical optics. Prerequisites: college physics and introductory biology. 3 units. *Fluke*

249. Biomechanics. Principles of fluid and solid mechanics applied to biological systems. Prerequisites: Physics 51 and Mathematics 31 or equivalents. 3 units. *Vogel and Wainwright*

250L. Physiology of Marine Animals. Environmental factors, biological rhythms, and behavioral adaptations in the comparative physiology of marine animals. Prerequisites: introductory biology and chemistry. (Also listed as Marine Sciences 250L.) 4 units. *Forward*

252. Comparative Physiology. Physiological mechanisms in relation to animal life in nature. 4 units. *Schmidt-Nielsen*

258L. Laboratory Research Methods. Radioactivity and scintillation counting, spectrophotometry and enzyme kinetics, protein and cell component separatory methods, other analytical methods, according to individual research interests. Prerequisite: consent of instructor. 4 units. *Fluke and staff*

259L. Laboratory in Biomechanics. Introduction to instruments used in investigations of solid and fluid biomechanics. Exercises and individual projects. Prerequisite: Zoology 249. 3 units. *Vogel and Wainwright*

261. Biology of Parasitism. How parasites, from viruses through vertebrates, have solved the special problems associated with their dependence on other organisms. Prerequisites: Zoology 74L and 160. 3 units. *M. Nijhout*

264S. Chromosomes, DNA, and Evolution. The impact of chromosome and DNA-sequence organization on evolution and vice versa; karyotype changes and speciation; repetitive DNA, split genes, jumping genes, and evolutionary mechanisms; the evolution of mitosis and the chromosome cycle. Prerequisite: cell biology or genetics. (Also listed as Microbiology and Immunology 264S and under the University Program in Genetics.) 3 units. *Nicklas*

269. Advanced Cell Biology. Structural and functional organization of cells and their components with emphasis on current research problems and prospects. Prerequisite: introductory cell biology or consent of instructor. (Also listed as Anatomy 269, Botany 269, Microbiology and Immunology 269, and under the University Program in Cell and Molecular Biology.) 3 units. *Nicklas and staff*

274L. Marine Invertebrate Zoology. Structures, functions, and habits of invertebrate animals under natural and experimental conditions. Field trips included. Not open to students who have had Zoology 175 or 275. Prerequisite: introductory biology. Offered at Beaufort. (Also listed as Marine Sciences 274L.) 6 units. *Barnes*

275L. Advanced Invertebrate Zoology. Classification, structure, function, and evolution of specified invertebrates. Field work, written and oral reports. Prerequisites: invertebrate zoology and consent of instructor. 3 units. *Wainwright*

278L. Invertebrate Developmental Biology. Gametogenesis, fertilization, and development of invertebrates, with emphasis on experimental studies of prelarval stages. Prerequisite: consent of instructor. Offered at Beaufort. (Also listed as Marine Sciences 278L.) 6 units. *McClay and visiting staff*

280. Principles of Genetics. Structure and properties of genes and chromosomes in individual organisms and in populations. Prerequisites: introductory biology and Chemistry 12 and Mathematics 31 or equivalents. (Also listed as Botany 280 and under the University Program in Genetics.) 3 units. *Antonovics (botany), Boynton (botany), and Gillham*

283. Extrachromosomal Inheritance. See course description for Botany 283. (Also listed under the University Program in Genetics.) 3 units. *Boynton and Gillham*

286. Evolutionary Mechanisms. See course description for Botany 286. (Also listed under the University Program in Genetics.) 3 units. *Antonovics (botany) and Wilbur*

293L. Population Biology. (Also listed as Botany 293L.) 3 units. *Wilbur and Antonovics (botany)*

295S, 296S. Seminar. Topics, instructors, and course credits announced each semester. (Also listed under Marine Sciences.) *Staff*

For Graduates

353, 354. Research. To be carried on under the direction of the appropriate staff members. Hours and credit to be arranged. (Also listed as Marine Sciences 353, 354.) *Staff*

360, 361. Tutorials. An approved academic exercise, such as writing an essay or learning a research skill, carried out under the direction of the appropriate staff members. Hours and credit to be arranged. *Staff*

RELATED PROGRAMS

Genetics, The University Program. Genetics courses offered by the Department of Zoology are part of the University Program in Genetics; see announcement in this bulletin.

Marine Sciences, The University Program. Consult Marine Sciences in this bulletin for offerings at the Duke University Marine Laboratory.

Program in Tropical Biology. Fellowships are available for travel and subsistence in field-oriented programs in Latin America. Refer to the section Organization for Tropical Studies in this bulletin in the chapter "Special and Cooperative Programs."

COURSES CURRENTLY UNSCHEDULED

224L. Herpetology

235. Evolutionary Systematics

239S. Biogeography

245. Radiation Biology

355, 356. Seminar

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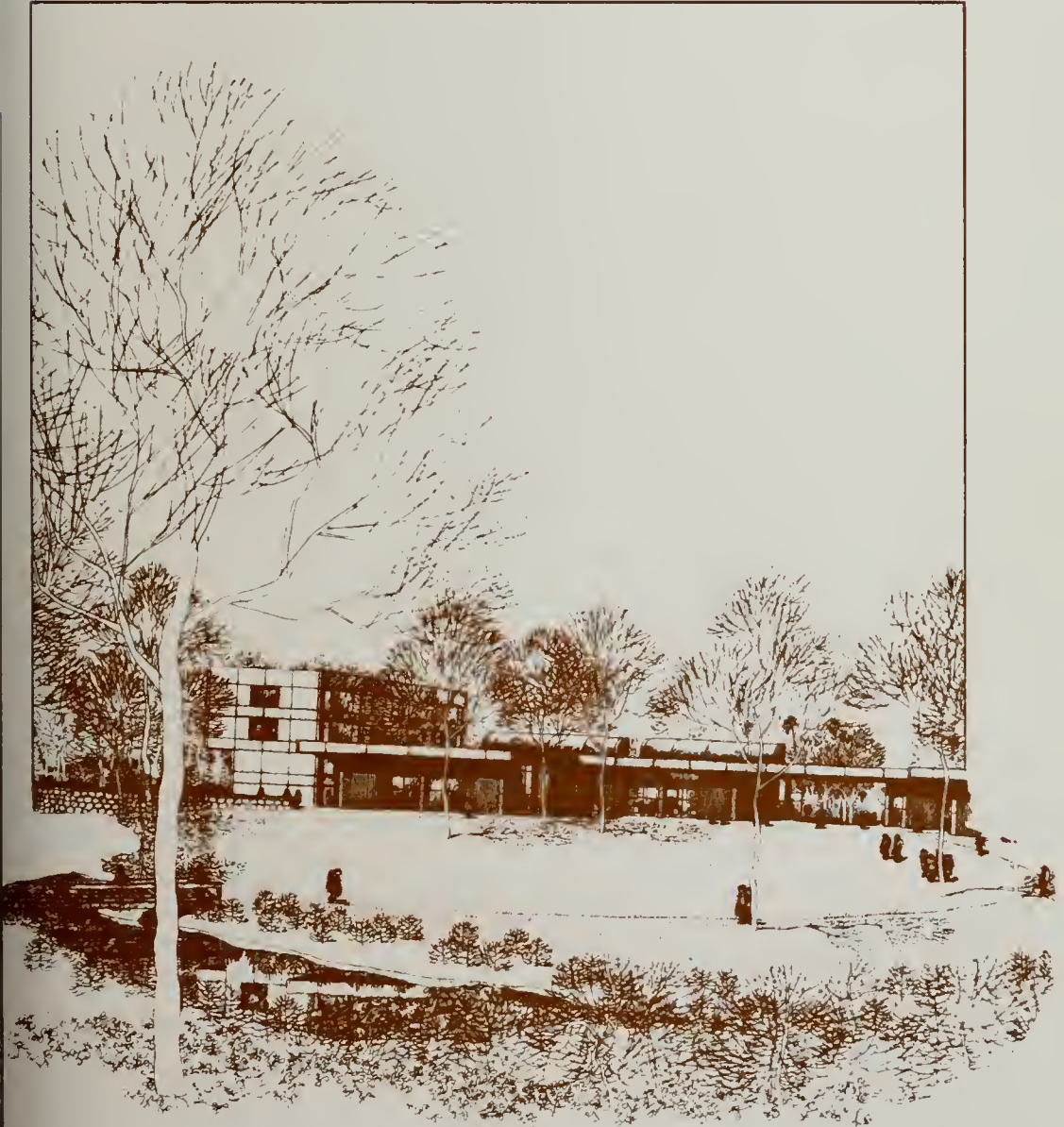
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EDITOR
Judy A. Beck
SENIOR EDITORIAL ASSISTANT
Elizabeth Matheson
FUQUA SCHOOL OF BUSINESS
Nancy Ruark

PHOTOGRAPHS
Bill Wilkerson

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The information in this bulletin applies to the academic year 1983-84 and is accurate and current, to the extent possible, as of July 1982. The University reserves the right to change programs of study, academic requirements, teaching staff, the calendar, and other matters described herein without prior notice, in accordance with established procedures.

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University Administration

General Administration

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Ray Watson, Ph.D., *Assistant Dean for Executive Education*
Anita MacNeill, M.B.A., *Executive Assistant to the Dean*
David L. Miller, Ph.D., *Director of Admissions and Financial Aid*
Lisa A. Mittnacht, B.A., *Director of Administration*





The Fuqua School of Business Calendar

1983

August	
26,29,30	Orientation and registration
31*	Fall classes begin
September	
5	Labor Day—no classes
October	
21–24*	Fall break
November	
23–25	Thanksgiving break
December	
12	Classes end
14–20	Examination period

1984

January	
9	Classes begin
March	
12–16	Spring break
April	
20	Classes end
24–30	Examination period
May	
6	Commencement

*Dates of fall registration and fall break subject to change by the Provost of Duke University during the 1982–83 year.



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A Message from the Dean

In his indenture establishing Duke University, James Buchanan Duke stated his desire that the University excel in the teaching of medicine, religion, and business. The Board of Trustees of Duke University, in 1969, established the Graduate School of Business Administration with a mandate to provide programs in management education of the highest quality. In 1980 the school was renamed to honor J. B. Fuqua of Atlanta, Georgia, who is a member of both the University's Board of Trustees and the school's Board of Visitors. Mr. Fuqua has supported the school through his generosity and his participation in its programs.

The mission of the Fuqua School of Business is to enhance the practice of management through education and research. Our approach is to prepare men and women to meet their career opportunities with a strong educational background and with an awareness of the need for initiative and leadership when faced with business challenges. We seek students who possess high academic standards and who also demonstrate the ability to think creatively. These are important qualities for business leadership and are reflected in the orientation of our entire program. As a school, we are committed to retaining our flexibility and our responsiveness to management needs as they arise in the business community.

Our heritage at Duke is a tradition of excellence in education. At the business school we have built on this heritage to develop programs which will enable graduates to meet the challenges of leadership in business, government, and educational organizations.

A handwritten signature in dark ink, reading "Thomas F. Keller". The script is fluid and cursive, with the first letters of the first and last names being capitalized and prominent.

Thomas F. Keller
Dean

General Information



Duke University

In 1839 a group of citizens from Randolph and adjacent counties in North Carolina assembled in a log schoolhouse to organize support for a local academy founded a few months earlier by Brantley York. Prompted, they said, by "no small share of philanthropy and patriotism," they espoused their belief that "ignorance and error are the banes not only of religious but also civil society which rear up an almost impregnable wall between man and happiness." Union Institute, which they then founded, was reorganized first in 1851 as Normal College to train teachers, and eight years later as Trinity College, a liberal arts college, which later moved to the growing city of Durham, North Carolina. With the establishment of the James B. Duke Indenture of Trust in 1924, Trinity College became Duke University. Today, Duke is a two-campus institution with a student body of about 9,000, of whom 3,000 are enrolled in the graduate and professional programs. Established in 1969, the Graduate School of Business Administration joined the Schools of Medicine, Nursing, Law, Engineering, Divinity, and Forestry in preparing qualified individuals for professional leadership and developing excellence in education for the professions.

In 1980, the Graduate School of Business Administration was renamed the Fuqua School of Business in honor of Mr. J. B. Fuqua.

The Campus. The main campus (West) of Duke University is a beautifully designed complex of buildings in Gothic architecture, bordered on the east by the Sarah P. Duke Gardens and on the west by the 8,000-acre Duke Forest. This campus is dominated by the Duke Chapel, whose 210-foot-high tower houses a 50-bell carillon. The William R. Perkins Library is one of the largest research libraries in the country. The new facility for the Fuqua School of Business is located on West Campus near the intersection of Science Drive and Towerview Drive. The East Campus is a smaller complex of Georgian-style buildings and has, as major points of interest, the Duke University Museum of Art and the Mary Duke Biddle Music Building.

Durham is a part of the Research Triangle, an area formed by Duke University, the University of North Carolina at Chapel Hill, and North Carolina State University at Raleigh. The Research Triangle Park, a 5,400-acre campus for research laboratories, governmental agencies, and research-oriented industries, is recognized as one of the world's leading science centers. Durham, located near the center of the state, has easy access to the Great Smokies of the Appalachian Mountains and to the scenic and historic beaches of the Outer Banks. The area offers varied cultural and recreational activities ranging from concerts, opera, dance, theater, and recitals to intramural and collegiate sports, boating, skiing, camping, and other outdoor activities.



Resources of the University

The Library System. The libraries of the University consist of the Perkins Library and its eight branches on campus: Biology-Forestry, Chemistry, Divinity, the East Campus Library, Engineering, Music, Physics-Math, and the Undergraduate Library; and the Pearse Memorial Library at the Duke Marine Laboratory in Beaufort. Also located on West Campus are the Law Library and the Medical Center Library and Communications Center. In June 1980, these libraries contained approximately 3,000,000 volumes and ranked nineteenth in size among academic libraries in the United States. More than 9,000 periodicals, 11,000 serials, and 200 newspapers are received regularly. The collection includes about 7,250,000 manuscripts, 85,000 maps, 29,000 sheets of music, and 419,000 rolls or sheets of microtext.

The William R. Perkins Library. The William R. Perkins Library—the main library of the University—houses most of the books and journals in the humanities and social sciences, large files of United States federal and state documents, public documents of many European and Latin American countries, publications of European academies and learned societies, and special collections from South Asian, Far Eastern, and Slavic countries. The newspaper collection, with 42,000 reels of microfilm, has several long eighteenth-century files, strong holdings of nineteenth-century New England papers and antebellum and Civil War papers from North Carolina, South Carolina,

and Virginia, as well as many European and Latin American papers. The manuscript collection of approximately five million items is particularly strong in all phases of life in the South Atlantic region. It also includes significant papers in English and American literature. The rare books collection contains materials covering a broad range of fields, and the Latin and Greek manuscripts constitute one of the outstanding collections in the United States. The collection of Confederate imprints is the largest in the country.

Tours of the Perkins Library are given frequently during Orientation Week and upon request throughout the year. Information about other campus libraries may be obtained from the staff in each of the libraries. Handbooks about library services and facilities are also available in each of the libraries.

Computation Center. The Duke University Computation Center provides the University faculty and students with a facility for research and instruction. The center is presently equipped with an IBM 370/158 computer with 6,144 bytes of memory, four 3330-II disk drives, twelve 3350 disk drives, six tape drives, two card readers, a card punch, four printers, and a digital plotter which is connected by a high-speed microwave link to one IBM 3081 (with sixteen million bytes of memory, multiple 3330- and 3350-type disk facilities, thirteen tape drivers, drums, card readers, and printers) located in the Research Triangle Park at the Triangle Universities Computation Center (TUCC), a nonprofit corporation formed jointly by Duke University, North Carolina State University at Raleigh, and the University of North Carolina at Chapel Hill. TUCC also has two Hewlett-Packard 2000F computers which provide BASIC interactive computing. Duke has four medium-speed terminals (card reader and printer), located in the Engineering Building, the Biological Sciences Building, and the Sociology-Psychology Building, and on East Campus, as well as several other low-speed keyboard terminals, connected to TUCC.

All users of the Computation Center facilities are urged to obtain funds to pay for computer services. Users unable to obtain grant funding may ask for financial support from their departments when applying for services. More specific information regarding Duke computing facilities may be obtained from the Director of the Computation Center.

In addition, the Fuqua School has its own computer facilities within its new building.

Programs of Study



The Master of Business Administration Program

The Duke M.B.A. degree is designed to prepare the individual to meet the challenges of rapid change in society through emphasis on concepts and analytical reasoning. The student is asked to structure unstructured situations and to propose solutions to complex problems. The particular focus on concepts and theory produces special qualities in the Duke M.B.A. graduate. By studying managerial theory and economic principles, the student acquires the capacity for assuming responsibility in a wide variety of specific assignments within an organization. By studying the problems of economic enterprise in an integrated fashion, the student develops a broader perspective for decision making. By studying analytical tools and problem structures, the candidate learns to identify common forms of problems that in many respects appear to be different, and to grasp the essential nature of problems in unfamiliar functions.

OUTLINE OF THE CURRICULUM

The M.B.A. degree requires four semesters of full-time work totaling 60 units of graduate course credit. On rare occasions, students who are exceptionally proficient in a particular subject will be allowed to substitute advanced course work for one or more core courses. There are no summer sessions for students in the M.B.A. program. The resources of the school are available to assist students in finding summer employment related to their interests which will aid in the selection of second-year electives. In many cases, the student electing the practicum may select a topic and begin work on it during the summer.

Modern management education is based on analytical reasoning which focuses on precise statements of relationships between variables. In a discipline which is future oriented, concepts of probability become especially important. For these and other reasons much of our course work assumes a firm grasp of mathematical concepts. We strongly encourage each applicant to come prepared with the necessary background. A working knowledge of calculus is essential. Evidence of this preparation is required for admission.

The First-Year Program. Course work in the first year is designed to provide the basic knowledge and tools for analysis of the operations of an organization. In the second semester of the first year, students are introduced to the functional areas of the firm. The first-year program includes:



Fall Semester

BA 300	Managerial Economics	3 units
BA 311	Statistical Analysis for Management	3 units
BA 312	Quantitative Analysis for Management	3 units
BA 320	Organization Behavior	3 units
BA 330	Financial Accounting	3 units
BA 318	Computer Laboratory	<u>Noncredit</u>
		15 units

Spring Semester

BA 301	Economic Environment of the Firm	3 units
BA 331	Managerial Accounting	3 units
BA 350	Financial Management	3 units
BA 360	Marketing Management	3 units
BA 370	Operations Management	3 units
BA 388	Business Communications	<u>Noncredit</u>
		15 units

The Second-Year Program. The second year of the M.B.A. program consists of one required course and nine electives. The required course stresses the application

of knowledge gained in the first year to the overall management process, to the integration and coordination of the planning function, and to strategy formulation and implementation. A key feature of the second year is the Management Game, used in BA 340, Business Policy and the Management Experience. The Management Game places teams of students in key management positions of firms which compete in a simulated market environment. Student teams are responsible for all aspects of their firm's operations, including formulation of objectives, design of the organizational structure, and decision making in marketing, production, finance, and personnel. Capital is acquired through negotiation between individual teams and local bankers. Each student team reports to a board of directors composed of faculty and business executives from the community.

The nine electives allow the students to develop additional depth in functional areas and freedom to concentrate their studies in a specific area of interest. Of the elective courses, one must be chosen from the environmental field which deals with the managerial implications of the economic, legal, social, and political environment of the firm. The courses satisfying this requirement are BA 302, BA 342, and BA 345. Students enrolled in the M.B.A./J.D. program are exempt from this requirement. The student may also elect up to four courses from other graduate and professional schools at Duke, or neighboring institutions in a reciprocal agreement with Duke. This allows the development of an individual program consistent with career goals.

The second-year program includes:

Fall Semester

BA 340	Business Policy and the Management Experience	3 units
	Electives	12 units
		<hr/> 15 units

Spring Semester

Electives	15 units
-----------	----------

M.B.A. with an Accounting Concentration

The M.B.A. degree with a concentration in accounting can be pursued by all students who are accepted into the Fuqua School of Business. This concentration provides the requisite background to sit for the certified public accounting examination, while also providing the necessary educational foundation needed for effective performance in either private or public accounting settings. The purpose of the program is to produce managers who are prepared to meet the emerging challenges faced by the professional accountant in industry, commerce, financial institutions, government, and public accounting.

The concentration in accounting requires candidates to pursue both a rigorous technical core in accounting as well as the regular core program taken by all candidates for the M.B.A. degree. Prerequisites for students to be accepted into the accounting concentration upon admission are the equivalent of Duke's Financial Accounting (BA 330) and Managerial Accounting (BA 331). These courses should be completed before entering the Fuqua School of Business, thus enabling the entering student to study more advanced topics in the accounting core during the first year. Those who do not have these necessary prerequisite courses may pursue them in the first year of the M.B.A. program, thus delaying their entrance into the accounting concentration until the second year.

The program requirements for the M.B.A. degree with a concentration in accounting for those who enter with the necessary prerequisites are, for the first year:

Fall Semester

BA 300	Managerial Economics	3 units
BA 311	Statistical Analysis for Management	3 units
BA 312	Quantitative Analysis for Management	3 units
BA 320	Organization Behavior	3 units
BA 430	Financial Accounting Standards and Analysis I	3 units
BA 318	Computer Laboratory	Noncredit
		<hr/> 15 units

Spring Semester

BA 301	Economic Environment of the Firm	3 units
BA 431	Financial Accounting Standards and Analysis II	3 units
BA 350	Financial Management	3 units
BA 360	Marketing Management	3 units
BA 370	Operations Management	3 units
BA 388	Business Communications	Noncredit
		<hr/> 15 units

The second-year program includes:

Fall Semester

BA 340	Business Policy and the Management Experience	3 units
BA 345	Legal Environment of the Firm	3 units
	Electives	9 units
		<hr/> 15 units

Spring Semester

BA 436	Internal Control, Auditing, and Information Systems Analysis	3 units
BA 446	Federal Income Taxation	3 units
	Electives	9 units
		<hr/> 15 units

At least one of the elective courses must be taken from the following: BA 432, BA 433, BA 435, BA 438.

The Doctor of Philosophy Program

The Ph.D. in Business Administration Program prepares candidates for research and teaching careers at leading educational institutions and for careers in business and governmental organizations where advanced research and analytical capabilities

are required. The Ph.D. program places major emphasis on independent inquiry, on the development of competence in research methodology, and on the communication of research results. Students are introduced at the outset of the program not only to rigorous course work, but also to the research activities of the faculty and of other students. (A ratio of doctoral students-in-residence to faculty of less than one to one facilitates this opportunity to work closely with faculty.)

The program requires that doctoral candidates must acquire expertise in three disciplines: economics, behavioral science, and quantitative methods. In addition, each candidate must acquire knowledge at the M.B.A. level of at least three of the following functional areas: accounting, finance, marketing, and operations management. Competence in the three disciplines and the functional areas may be gained from the student's choice of course work, participation in seminars, and independent study. Each student takes a comprehensive exam at the end of the second year or the beginning of the third year of residence. The final requirement is the presentation of a dissertation. The Ph.D. program usually requires three to four years of work beyond the bachelor degree. Students entering the program with an M.B.A. or other advanced work will usually be able to reduce the time in residence by a year. The student and his/her faculty committee determine the specific program of study, subject to the approval of the Director of the doctoral program.

The Ph.D. program currently emphasizes research and training in the areas of marketing, behavioral sciences and organizational theory, finance, accounting and quantitative methods, and regulatory economics. Other areas of emphasis will be developed as faculty are added to the staff of the Fuqua School of Business.

It is the policy of the school to provide research assistantships or fellowships to all new Ph.D. students. The school normally continues to provide financial support for six to eight semesters, as long as the student continues to make satisfactory progress toward the Ph.D.

The Ph.D. in business administration is a degree of the Graduate School of Duke University. Application forms should be obtained from and returned to the Director of Admissions, The Graduate School, Room 127, Allen Building, Duke University, Durham, North Carolina 27706.

Special Programs

CONCURRENT DEGREE PROGRAMS

The Fuqua School of Business offers combined degree programs with the School of Law, the School of Forestry and Environmental Studies, and the Institute of Policy Sciences and Public Affairs. By recognizing certain areas of study common to the M.B.A. and each of the other advanced degrees, duplication of instruction is eliminated and students are able to obtain the concurrent degrees in less time than would normally be required to obtain the two degrees separately. Students are normally required to take 48 units of business administration course work following admission to the program.

The M.B.A.-J.D. The concurrent M.B.A.-J.D. program requires four academic years of study with a full year in each school and two years of combined study that meets the requirements for both the M.B.A. and J.D. degrees. Students must apply for admission and be accepted by both the School of Law and the Fuqua School of Business. Additional information on the program may be obtained from the Director of Admissions, the Fuqua School of Business, Duke University, and the Admissions Office, Duke University School of Law.

The M.B.A.-M.F. and the M.B.A.-M.E.M. The concurrent Master of Business Administration and Master of Forestry or Master of Environmental Management



degrees normally require three years of study. Students must apply for admission and be accepted by both the School of Forestry and Environmental Studies and the Fuqua School of Business. Additional information on the program may be obtained from the Director of Admissions, the Fuqua School of Business, Duke University, and the Director of Admissions, Duke University School of Forestry and Environmental Studies.

The M.B.A.-A.M. in Public Policy Sciences. The concurrent Master of Business Administration degree and Master of Arts degree in Public Policy Sciences normally requires two and a half to three years of study. The joint degree curriculum requires a minimum of thirty credits to be specified by the Institute of Policy Sciences and Public Affairs, and forty-eight credits to be specified by the Fuqua School of Business. Students must apply to and be accepted by both the Fuqua School of Business of Duke University and the Graduate School of Duke University. Additional information may be obtained from the Director of Admissions, the Fuqua School of Business, Duke University, and the Director of Graduate Studies, Institute of Policy Sciences and Public Affairs.

Public Policy Option. For those students interested in management careers in the public or not-for-profit sectors the Fuqua School of Business offers a public policy option. This option consists of a recommended set of M.B.A. elective courses to be taken in the Institute of Policy Sciences and Public Affairs. Students interested in pursuing this option must obtain the consent of the institute's faculty adviser of M.B.A. students and the consent of the M.B.A. program director.

COMBINED UNDERGRADUATE-PROFESSIONAL DEGREES

Also known as the "three-two" program, the combined undergraduate-professional degree program provides that the Bachelor of Science or Bachelor of Arts degree may be awarded to students who successfully complete three years in an approved curriculum in arts and sciences at Duke and also the first year of study for the Master of Business Administration. After two years at Duke and before transfer to the Fuqua School of Business, students may apply for the three-two program through their academic dean. To be eligible for the combined program a student must successfully complete all baccalaureate requirements (except eight elective courses) and be admitted to the business school. Upon satisfactory completion of the first two semesters in the Fuqua School of Business, the student will be awarded a baccalaureate degree. The M.B.A. degree is awarded upon completion of the second year of the program.

EXECUTIVE M.B.A. PROGRAM

The Fuqua School of Business offers an M.B.A. degree for managers in the greater Raleigh-Durham area. The program is designed for those who are seeking a broad educational base as preparation for more senior managerial positions, while continuing full-time job responsibilities. Major objectives of the program are to improve decision-making and management skills, and the effective utilization of these skills in resolving contemporary management problems.

The Executive M.B.A. Program requires twenty-five months of study and includes six semesters of course work. Students interested in the program should contact the Director of the Executive M.B.A. Program or the Director of Admissions, Fuqua School of Business, Duke University.

EXECUTIVE EDUCATION

The Fuqua School of Business offers various executive development programs. These nondegree programs are designed to meet the needs of business organizations and their executives. The courses vary in length from a few days to four weeks and are tailored to the requirements of the participating group. The programs are usually residential, giving participants maximum involvement with each other and with the faculty. Major programs include a four-week Advanced Management Program and two-week programs in Strategic Human Resources Management and Strategic Production Management. Other recent offerings have included programs in cash management, management science in banking, and management of capital expenditures.

Further information on the school's executive development programs may be obtained from the Assistant Dean for Executive Education, Fuqua School of Business, Duke University.

Admissions



Admissions

Admission to the Fuqua School of Business is open to men and women who hold bachelor's degrees from accredited colleges and universities. No specific undergraduate major is deemed preferable to any other; however, the programs have been designed primarily for persons with training in the liberal arts, engineering, or the sciences. The Admissions Committee seeks those candidates with leadership potential who are prepared to compete successfully in a demanding course of study which requires logical and analytical reasoning. All entering students are expected to have a working knowledge of calculus, and applications are reviewed closely for this ability.

Prior work experience is not considered a requirement for the M.B.A.; however, the Admissions Committee recognizes the value of full-time work experience and considers it a positive factor in admission decisions.

Application Information. Each applicant must submit the following to the Director of Admissions before action can be taken:

1. **Application Form:** Applicants should not feel constrained by the available space on the application form. Since it is desirable that the application be as complete as possible, additional sheets should be used if necessary. Careful completion of the application will ensure a thorough evaluation.

2. **College Transcripts:** An official transcript from each of the colleges *attended* must be sent to the Director of Admissions. Students who apply during their senior year must ensure that a final transcript be received by the business school prior to enrolling.

3. **Letters of Recommendation:** Three letters of recommendation are required and must be sent to the Director of Admissions. Recent graduates or those in their senior year should have at least two letters submitted from persons familiar with their academic ability.

4. **Graduate Management Admission Test:** Score reports must be sent directly from the Educational Testing Service to the Fuqua School of Business.

5. **Application Fee:** A nonrefundable fee of \$35 to cover processing must be submitted with the application.

Any questions or requests for application materials should be addressed to the Director of Admissions, The Fuqua School of Business, Duke University, Durham, North Carolina 27706.

Application Deadline. A continuous admissions policy is followed in the Fuqua School of Business in that admission decisions are made as applications are com-



pleted. Generally, applications will be reviewed and given a decision approximately six weeks later. Application credentials should be on file in the school by April 1. The application file must be complete before action can be taken. A limited number of places in the class are available for applications completed after April 1; therefore, those wishing to apply after the normal deadline may do so.

Notification of Status. When the applicant has been accepted, a letter of admission and an acceptance form will be sent. A nonrefundable tuition deposit of \$200 will be required to reserve a place in the class. The process of admission is not complete until the statement of acceptance and the tuition deposit have been returned to the Director of Admissions.

Applicants notified of acceptance prior to April 1 will be expected to make the \$200 tuition deposit by April 15. Applicants notified of acceptance after April 1 will be expected to make the tuition deposit within two weeks of the notification, or the place in the entering class will be forfeited. It should be reiterated that the tuition deposit is in all cases nonrefundable.

Graduate Management Admission Test. The Graduate Management Admission Test, required of all applicants, is administered by the Educational Testing Service. Detailed information about the test and application forms may be obtained by writing directly to the Educational Testing Service, Box 966, Princeton, New Jersey 08540.

The examination is administered at many centers throughout the United States and abroad. Arrangements to take the test at an established center must be made four weeks before the test date (six weeks prior to test date at established foreign centers). The examination is given four times a year. Special centers may be arranged for persons distant from established centers. Requests for such accommodations must be made at least eight weeks prior to the selected test date. Applicants are encouraged to take the test in October or January; those taking the test in March or June run the risk of having the class already filled by the time scores are available.

Admission of Foreign Students. Fully qualified students from outside the United States are welcome at the Fuqua School of Business. In applying for admission, the foreign student should submit, in addition to the above credentials, the following:

1. If the native language is not English, the results of the Test of English as a Foreign Language (TOEFL) must be submitted. Most successful applicants score approximately 600 or better on the TOEFL.
2. A statement certified by a responsible person that finances are sufficient to maintain the student during the stay at Duke University. The University does not at the present have fellowship or loan programs for foreign students.
3. A statement by a qualified physician describing the physical and mental health of the applicant.

The M.B.A. program is a two-year program and all students are expected to complete the required course work in the allotted time period. Foreign applicants should be prepared to carry the normal course load as described earlier in the bulletin. For this reason, applicants whose native language is not English should consider the merits of attending an intensive English language program or enrolling in summer school courses at a university in the United States prior to enrolling at Duke. Since the course work in the program will involve lectures, discussions, and group projects, a firm understanding of the language is required.

Financial Information



Tuition and Fees

The tuition for students in the Fuqua School for the year 1982–83 is \$3,700 per semester. All charges are due and payable at the times specified by the University and are subject to change without notice. Registration is not considered complete, and students may not be admitted to classes, until arrangements have been made with the Bursar of the University for the payment of tuition and fees. A late registration fee of \$25 is charged any student not completing registration during the registration periods. A \$5 charge will be imposed for any student's check returned to the University unpaid.

After the beginning of classes, refunds will be made on a pro rata basis. Students may elect to have tuition charges refunded or carried forward as a credit for later study according to the following schedule:

1. Withdrawal before classes begin: full refund.
2. Withdrawal during the first or second week of classes: 80 percent.
3. Withdrawal during the third, fourth, or fifth week of classes: 60 percent.
4. Withdrawal during the sixth week: 20 percent.
5. Withdrawal after the sixth week: No refunds.

Tuition or other charges paid from grants or loans will be restored to those funds not refunded or carried forward.

If for any reason during the program, a student should find it necessary to request a reduction in the normal course load, this request will be reviewed by the Program Director. If the Program Director approves a reduction in the course load, the student has the right to request a corresponding reduction in his/her tuition charges. These requests will be considered only for those students for whom the course reduction will necessitate enrollment in the Fuqua School in excess of four semesters for M.B.A. students or six semesters for Executive M.B.A. students. Students receiving approval for a tuition reduction will be charged on a pro rata basis.

M.B.A. Association Student Activity Fee. All students are assessed a \$15 non-refundable fee to be used to support the activities of the M.B.A. Association.

Athletic Tickets. Athletic ticket books are available to graduate students. Purchase is optional, with payment due in the fall semester.

Vehicle Fee. Each student possessing or maintaining a motor vehicle at Duke University shall register it at the beginning of the academic year in the Duke Public Safety Office at 2010 Campus Drive. A student who acquires a motor vehicle and

maintains it at Duke University after academic registration must register it within five calendar days after operation on the campus begins. Resident students are required to pay an annual fee for each motor vehicle.

At the time of registration of a motor vehicle the following documents must be presented: state vehicle registration certificate, valid driver's license, and a student identification card.

Transcript Fee. Students who wish to obtain copies of their academic records should direct requests to the registrar's office, 103 Allen Building. Ten days should be allowed for processing. A minimum fee of \$2, payable in advance, is charged for a single copy. When two or more copies are forwarded to a single address, a charge of fifty cents will be added for each additional copy.

Student Health Fee. All students are assessed a nonrefundable fee for the Student Health Service. The fee for 1982-83 is \$170 (\$85 per semester).

Student Accident and Sickness Insurance. The University has made arrangements for a Student Accident and Sickness Insurance Plan to cover all full-time students for a twelve-month period. For an additional fee a student may obtain coverage for a spouse and children. Although participation in this program is voluntary, the University requires all graduate students to be financially responsible for medical expenses above those covered by the University Student Health Program through the University Accident and Sickness Policy, a private policy, or personal financial resources. Students who have equivalent medical insurance or wish to accept the financial responsibility for any medical expense may elect not to take the Duke plan by signing a statement to this effect. *Each full-time student in residence must purchase this student health insurance or indicate the alternative arrangement.* The Student Accident and Sickness Insurance Policy provides protection twenty-four hours per day during the full twelve-month term of the policy for each student insured. Students are covered on and off campus, at home, while traveling between home and school, and during interim vacation periods. The term of the policy is from the opening day of school in the fall. Coverage, services, and costs are subject to change each year as deemed necessary by the University. The rates for 1982-83 are: student only—\$130 per year; and family plan (student, spouse, and children)—\$362 per year.

Living Expenses. The estimated living costs for the 1982-83 academic year are \$5,245 for a single student and \$8,450 for a married student. These estimates include room and board, and allowances for transportation and miscellaneous personal expenses.

Debts. No records are released until students have settled with the Bursar for all indebtedness. Failure to pay all University charges on or before the times specified by the University will bar the student from class attendance until the account is settled in full.

Students are expected to meet academic requirements and financial obligations, as specified elsewhere in this bulletin, in order to remain in good standing. Certain non-academic rules and regulations must be observed also. Failure to meet these requirements may result in dismissal by the appropriate officer of the University.

Financial Aid

The Fuqua School of Business endeavors to make it possible for qualified students to attend Duke even though their own resources may be insufficient. Financial aid is available in the form of fellowships and various loan programs. Applicants are expected to make use of personal savings, veterans' benefits, summer income, and loans from family and other outside resources prior to requesting aid.

The Fuqua School of Business Fellowships. A number of fellowships are available to incoming students. These fellowships are awarded based on academic achievement, test scores, extracurricular activities, and professional achievement. The awards are for two years of graduate study, ranging from partial tuition to full tuition. Requests for fellowships should be filed no later than March 1 to receive full consideration.

Named Gift Fellowships. The following awards are among the named gift fellowships offered by the Fuqua School of Business.

Accounting Associates Fellowship. These fellowships were established in 1976 through the donation of the Accounting Associates, a partnership of Duke University accounting professors. These awards are given annually to M.B.A. students pursuing an interest in accounting.

Chicago Mercantile Exchange Scholarships. Two awards are made annually. Special consideration is given to qualified students who have a demonstrated interest in entrepreneurship or futures and options markets.

Junior Achievement Scholarships. A grant from the Little Family Foundation supports two awards annually having a stipend of \$5,000 each. These scholarships are given to persons who have participated actively in a Junior Achievement Company or who have worked as an adviser to a Junior Achievement Company. First preference is given to company participants who have two or more years of full-time work experience; second preference is given to advisers who have two or more years of work experience; and final preference is given to participants who do not have work experience.

Martin L. Black Fellowships. Established in 1974 through the gifts and donations of alumni and friends of Martin L. Black, a faculty member in accounting at Duke for over forty years, these fellowships are awarded to M.B.A. students who plan to concentrate in accounting.

Mead Scholarship. These scholarships, established in 1977 by the donation of Mr. D. Richard Mead, Jr. (A.B., 1952), are given to outstanding M.B.A. students who, without such support, might otherwise not be able to afford the cost of continued graduate study.

Wachovia Scholarships. These scholarships are awarded to students who show promise of academic excellence and leadership potential. They were established in 1975 by Wachovia Bank and Trust Company.

Loans. The Fuqua School of Business operates three loan programs. Students who demonstrate need according to federal guidelines and information supplied on a Graduate and Professional School Financial Aid Service (GAPSFAS) form, are eligible to participate in these programs.

Federally Insured Student Loan Program. State agencies and banks operate Federally Insured Student Loan programs (FISL). The FISL program bears no interest charge to qualified borrowers while full-time student status is maintained. Repayment begins six months after graduation. The maximum allocation is \$5,000 per year. Students are required to seek FISL assistance through their own state agencies or local banks.

Students who are unable to obtain funds from their state agencies or banks will be considered as eligible for participation in Duke's FISL program. The interest rates, loan limits, and repayment guidelines for Duke's FISL program are comparable to the FISL programs offered by state agencies.

National Direct Student Loan Program. The Fuqua School offers a limited number of NDSL loans. These loans accrue no interest while the student maintains full-time status. Interest charges and repayment begin six months after graduation. These loans are awarded by the Financial Aid Office and are part of a student's loan package. They are not applied for separately.

The Fuqua School of Business Loan Program. Under this program, students in the Fuqua School may borrow funds to help finance their M.B.A. education. The loan program is administered by the Fuqua School of Duke University.

To qualify for this loan, the student must be a United States citizen or a permanent resident of the United States or Canada and be enrolled or accepted for enrollment in the Fuqua School of Business. He or she must also show reasonable need and credit worthiness as defined by the Loan Committee.

The rate of interest will be fixed annually and disclosed at the time of application. During the period the student is in residence at Duke interest will be added to the loan annually as it accrues.

Repayment will normally begin in September following graduation and will be on a monthly basis. The maximum term of a loan will depend primarily on the size of the loan, with consideration also being given to the individual's total educational indebtedness, but not to exceed ten years. All payments are applied first to interest with the balance reducing the amount of the indebtedness.

College Work-Study Program. The College Work-Study program is a federally funded program supporting the employment of students. Under this program, a student's salary is paid jointly by the federal government and the campus employer. Students must meet federal need standards to qualify. If a student is given a work-study allocation, it is the individual's responsibility to find employment either within the school or elsewhere on campus.

Financial Aid Application. Financial aid decisions are made as applications are completed, with the first awards being granted about March 15. All students applying for financial aid must complete the Financial Aid Application and a GAPSFAS form. The GAPSFAS application may be obtained from the Graduate and Professional School Financial Aid Service, Box 2614, Princeton, New Jersey 08540, and should be filed no later than February 1, in order to ensure its arrival at Duke by March 1. Federal law requires verification of income data submitted prior to January 1. Students are therefore encouraged to delay GAPSFAS filing until after January 1. The GAPSFAS contains sections to be completed by the applicant, by the spouse or spouse-to-be, and by the applicant's parents. Applicants who have been claimed as dependents by their parents in the previous year or who will not be considered independent by federal standards must have the parents' questionnaire section completed.



Career Counseling and Placement



Career Counseling and Placement Office

The Fuqua School maintains a Career Counseling and Placement Office exclusively for the use of full-time M.B.A. candidates and alumni. Students who register with the office are offered the opportunity to assemble a complete dossier of academic records and recommendations to supplement applications for employment and to establish a permanent file for future use. The office maintains an up-to-date library of employer/career information and houses private interview facilities. Interviews are scheduled throughout the year for students registered with the office. The office arranges informal student-employer sessions for firms visiting the campus who wish to make pre-interview presentations. The Director of Career Counseling and Placement is available to talk with students about their individual plans, goals, and career opportunities.

Career Planning Seminar. The placement office conducts a career planning seminar which is open to all students of the school. The seminar focuses on resume preparation, effective interviewing techniques, business etiquette, and appropriate business attire. Topics may vary according to student needs. Guest speakers from various career fields are featured.

Resumes. The placement office coordinates preparation of individual student resumes. Each student receives a supply of resumes for his or her personal use. Student resumes of both classes are collected and published in separate composite resume books which are distributed to several hundred potential employers.

Annual Job Fair. The Job Fair is sponsored by the M.B.A. Association and the Office of Career Counseling and Placement. The fair provides an excellent opportunity for both first and second year students to talk in a relaxed and informal atmosphere. As a result of the program, many students arrive at early decisions concerning their area of career interest.

Career Alternative Workshops. The placement office, in cooperation with the M.B.A. Association, sponsors a series of career alternative workshops for first-year students. These workshops feature professionals from various fields including commercial and investment banking, public accounting, management consulting, finance, marketing, and operations management.

Professional Affiliations. The placement director is a member of the College Placement Council (CPC), the Middle Atlantic Placement Association (MAPA), and the Southern College Placement Association (SCPA), and regularly attends their meet-

ings to stay abreast of recent developments in the placement field as well as maintain contact with regional and national employers. The placement office participates in the nationwide CPC Salary Survey which is a major source of comparative salary data for career planning.

Companies Recruiting in 1981-82

AT&T Long Lines
Ajinomoto, USA, Inc.
American Hospital Supply Corporation
American Management Systems
Arthur Andersen & Company
Arthur Young & Company
Bank of America
BarclaysAmerican Corporation
Benton & Bowles, Inc.
Borg Warner Chemicals
Brown & Williamson Tobacco Co.
Burlington Industries, Inc.
Carolina Power & Light Company
Chase Manhattan Bank, N.A.
Chemical Bank
Ciba Geigy Corporation
Citizens & Southern National Bank
Corning Glass Works
Conoco Chemicals
Continental Illinois Bank
The Cooper Group
Coopers & Lybrand
Data General
Datapoint
Deloitte, Haskins & Sells
Eastman Kodak Company
Eli Lilly & Company
Ernst & Whinney
Ethyl Corporation
Exxon Company, USA
The Fails Management Institute
The Family Lines Rail System
Federal Express
First National Bank of Chicago
First National Bank in Dallas
First National Bank of Maryland
First Union National Bank
Formby's, Inc.
Frito-Lay, Inc.
GTE-Southeast
General Foods Corporation
General Mills, Inc.
General Motors Corporation
Girard Bank
Goldman Sachs & Company
W. R. Grace & Company
Greyhound Leasing & Financial Corp.
Gulf Oil Company
Hallmark Cards, Inc.
Hewlett-Packard
H. J. Heinz & Co.
Home Box Office

IBM Corporation
International Paper Company
International Telephone & Telegraph
Irving Trust Company
Kayser Roth
Kendall Company
Kidder, Peabody & Company
L'Eggs Products, Inc.
Manufacturers Hanover Trust Co.
Marriott Corporation
Max Factor
Mellon Bank, N.A.
Metropolitan Life Insurance Co.
Milliken & Company
Mobil Oil Corporation
Morgan Guaranty Trust Co.
N L Industries, Inc.
North Carolina National Bank
Northern Telecom, Inc.
The Northern Trust Company
Paine, Webber, Mitchell, Hutchins
Peat, Marwick, Mitchell & Company
Pepsi Cola
Peterson, Howell, Heather, Inc.
Pfizer, Inc.
Philadelphia National Bank
Philip Morris
Pittsburgh National Bank
Price Waterhouse
Procter & Gamble
Prudential Financial Corporation
R. J. Reynolds Industries, Inc.
Richardson-Vicks, Inc.
Ryder System, Inc.
J. Henry Schroder Bank & Trust Company
Scott Paper Company
Shawmut Bank of Boston
Siecor
Soabar Graphics
Southeast First National Bank of Miami
Southwest Bancshares, Inc.
Texas Commerce Bank
Touche Ross & Co.
Trammell Crow
Union Carbide
U.S. Steel Corporation
Wachovia Bank & Trust Co., N.A.
Westinghouse Electric Corp.
Woodrow Wilson Foundation
World Bank
Xerox Corporation



Student Life



Living Accommodations

Duke University has several residential facilities in which graduate and professional students reside: Town House Apartments, modular homes for single students, and Central Campus Apartments for single and married students.

Town House Apartments. Town House Apartments, located in the Central Campus area, is a thirty-two-unit complex, which houses graduate and professional school students. These apartments are more spacious than the apartments found on campus or in Durham. Because of its location away from the academic facilities of the two campuses, students find that these apartments offer a change from normal campus life and activities. These two-bedroom units are furnished for two single graduate students and are available for continuous occupancy, summer months included.

Each air-conditioned apartment includes a living room, master bedroom, one and one-half baths, a single bedroom, and an all-electric kitchen with a dining area. Spacious closets and storage spaces are provided within each apartment.

Occupants must make arrangements with the local utility companies to pay for electricity, gas, and telephone service. These companies usually require a deposit when initial applications for service are made.

Central Campus Apartments. During 1975, Duke University completed a 500-unit apartment complex. The apartments are two- and three-bedroom units, with a limited number of efficiencies also available. The units are available throughout the calendar year for continuous occupancy.

All utilities—water, heat, air-conditioning, and electricity—are provided. Telephones, which are provided in preinstalled locations in each apartment, are serviced through Duke University's Tel-Com telephone service. Central Campus Apartments' residents are responsible for having their phones connected.

Spaces in apartments for single students are provided on an individual basis with each student paying rent per academic term to the University. This method permits students to share apartments with others of their choice. When this arrangement is impractical, the Department of Housing Management strives to place persons with similar interests together. Single student apartments are completely furnished. An itemization of furnishings is included with the floor plans sent out in the application packet.

Central Campus Apartments are provided on a lease basis to married students, and monthly rental payments should be made as required by the terms of the lease. Married students may request either unfurnished or partially furnished apartments. Draperies and kitchen appliances are furnished in all apartments.

Modular Homes. Duke University owns six prefabricated modular homes which are located one block from the main east-west bus line. These three-bedroom homes are completely furnished for three-person occupancy and provide more privacy than most apartments.

The homes are available to single graduate and professional students for continuous occupancy throughout the calendar year.

In addition to having three bedrooms, each home contains a full bath, an all-electric kitchen, a dining area, and a living room. Sliding glass doors in the living room open onto a wooden deck. An outside storage area is provided in addition to spacious closets within the home. Except for the bathroom, kitchen, and dining area, the homes are completely carpeted and paneled.

Residents of the modular homes are responsible for making arrangements with local utility companies for gas, electricity, and telephone services.

Application Procedure. The Department of Housing Management provides students accepted to the University with housing application forms and detailed information on rates, rental agreements, and availability of housing. A completed and returned application form, accompanied by the required residential deposit, is necessary to be considered for assignment. Applications will be processed on a first-apply, first-assigned basis.

Food Services

Food service facilities located throughout the Duke campus include both board plan and cash operations. Graduate and professional students are welcome to eat in any of the board plan cafeterias at guest meal prices, or may participate voluntarily in any of the point plans. Details are available from the Food Services Business Office, 106 West Campus Union Building. Board plans in the Blue and White Room Cafeteria and the East Court Cafeteria provide participants and their guests with "unlimited seconds" style meals throughout the week at set prices. Dining facilities on the West Campus include a cafeteria with multiple-choice menus, the Oak Room with table service, the Sprig which serves soup and salad bar lunches, the Cambridge Inn with fast foods and beverages, and the Construction Company with late night sandwich service. The Bryan Center has a snack bar and a Rathskeller, both open all week, morning through late evening. East Campus has cafeteria service and a snack bar. Trent Drive Hall has a public cafeteria and Gradel's, a snack bar/delicatessen. The Sprout is a salad and soup bar open for lunch Monday through Friday. Duke University Food Services is the largest student employer on campus, and hires students in almost every food operation. A listing of open positions and areas is available from the Personnel Office, 106 West Campus Union Building.

Student Activities

M.B.A. Student Association. The association serves as liaison between the students and faculty and administration in both academic and nonacademic matters. The structure of the association includes several standing and ad hoc committees dealing with concerns such as admissions and placement, computer and library facilities, intramural sports participation, alumni, and social events.

Cocurricular Activities. Graduate students at Duke University are welcome to use such University recreational facilities as swimming pools, tennis courts, and golf course, and to affiliate with the choral, dance, drama, music, and religious groups. They may become junior members of the American Association of University Professors and may affiliate with Phi Beta Kappa and social fraternities.

A full program of cultural, recreational, and religious activities is presented by the Office of Cultural Affairs, the Duke University Christian Council, the Duke Uni-

versity Parish Ministry, the Duke University Union, the Office of Student Activities, and recreational clubs. Most programs are open to the entire University community. The student activities office assists various sporting clubs in planning trips, and sponsors bus or van weekend trips to the beach and mountains. Inquiries should be directed to the Office of Cultural Affairs, 107 Page Building; Duke Chapel; the Duke University Union, 101 Bryan Center; or the Office of Student Activities, Bryan Center.

Opened in 1982, the Bryan Center is the hub of cultural, social, recreational, cocurricular, and service activities. It houses the University stores, a rathskellar, a snack bar, three first-rate theaters, a post office, bank services, an art gallery, meeting rooms, a ballroom, a crafts center, a games room, a mall, and lounges.

Full information regarding the scheduling of major events and programs for the entire year will be found in the Duke University *Annual Calendar*; detailed and updated information for the fall and spring semesters in the *Weekly Calendar* available each Friday; updated information for the summer session in the *Summer Session Calendar*, published at the beginning of each summer term; and the *Duke Chronicle*, published each Monday through Friday during the fall and spring and each Wednesday during the summer. Copies of the Duke University calendars may be obtained at the information desk, Flowers Building, or the calendar office, Page Building. Also during the summer, the *Summer Session Newsletter* is published twice weekly by the summer session office and is available at convenient locations.

Intramural and Recreational Sports. The Duke recreational and intramural programs provide all students with an opportunity to participate in some form of informal and competitive physical activity.

The men's program consists of seventeen different activities which include archery, bowling, cross country, golf, handball, horseshoes, tennis, flag football, badminton, raquetball, basketball, swimming, table tennis, volleyball, wrestling, softball, and track. In a typical year more than 3,000 students compete for the many intramural titles and trophies that are awarded. Each year Duke, U.N.C., N.C. State, and Wake Forest meet in the annual Big Four Intramural Day.

The women's program encompasses competition in badminton, basketball, bowling, tennis, and volleyball. In addition, various clubs including modern dance, water ballet, and other sports offer the student opportunities to take part in extracurricular activities.

Through coeducational intramurals, the student is encouraged to participate on a less competitive level promoting relaxed social as well as physical activity. There is coeducational competition in badminton, table tennis, tennis, and volleyball. Numerous other activities are being planned so that women will have opportunities similar to those available for men.

The University's varied athletic and recreational facilities and equipment are available for use by the students. The facilities for recreation include a golf course, lighted tennis courts, three swimming pools, a student activities building, three gymnasias, outdoor handball and basketball courts, an all-weather track, and numerous playing fields and informal recreational areas. A variety of clubs dealing with archery, gymnastics, scuba diving, sailing, cycling, badminton, karate, rugby, soccer, and other activities are available to interested students.

Services Available

Medical Care. The aim of the Student Health Service is to provide any medical care and health advice necessary to the student as a member of the University community. The Health Service maintains the Student Health Services Clinic located in the Pickens Building on West Campus and the University Infirmary on the East Campus. Emergency transportation can be obtained by the Duke campus police. A separate fee for the Student Health Service is assessed.

The Student Health Service offers varied benefits. To secure them, full-time graduate students must be in residence; during the fall and spring semesters, they must be registered for at least 9 units per semester until they have passed the doctoral preliminary examination, after which they must be registered for at least 3 units in residence. During the summer, graduate students must be registered for at least 1 unit of research or 3 units of course work.

The Student Health Services Clinic offers the student outpatient services, routine laboratory and X-ray examinations in the clinic for the treatment of acute illness or injury, and advice and assistance in arranging consultation for medical treatments. Fees for such consultations or treatments must be paid by a student who is not covered by an insurance plan.

The facilities of the University Infirmary are available to all currently enrolled full-time students in residence during the fall and spring. Hospitalization in the University Infirmary is provided for treatment of acute illness or injury as authorized by the Student Health Services Clinic physician. Students are required to pay for their meals while confined to the infirmary.

The resources of the Duke University Medical Center are available to all Duke students and their spouses and children. Any bills incurred at Duke Hospital or any other hospital are the responsibility of the student, if not covered by an insurance plan. The Student Health Program does not provide health care for spouses and dependent children of married students. Coverage of the married student's family is provided in the University's Student Accident and Sickness Insurance Plan for an additional fee.

The University has made arrangements for a Student Accident and Sickness Insurance Plan to cover all full-time students for a twelve-month period. For an additional fee a student may obtain coverage for a spouse and children. Although participation in this program is voluntary, the University requires all graduate students to be financially responsible for medical expenses above those covered by the University Student Health Program through the University Accident and Sickness Policy, a private policy, or personal financial resources. Students who have equivalent medical insurance or wish to accept the financial responsibility for any medical expense may elect not to take the Duke plan by signing a statement to this effect. *Each full-time student in residence during the fall and spring must purchase this student health insurance or indicate the alternative arrangement.* The Student Accident and Sickness Insurance Policy provides protection twenty-four hours per day during the full twelve-month term of the policy for each student insured. Students are covered on and off campus, at home, while traveling between home and school, and during interim vacation periods. The term of the policy is from the opening day of school in the fall. Coverage and services are subject to change each year as deemed necessary by the University in terms of costs and usage.

Counseling and Psychological Services. Counseling and Psychological Services (CAPS) is a component of student services which provides a coordinated, comprehensive range of counseling and developmental services to assist and promote the personal growth of Duke students. The professional staff is composed of psychologists, clinical social workers, and psychiatrists experienced in working with young adults. They provide evaluation and brief counseling/psychotherapy regarding a wide range of concerns, including such issues as self-esteem and identity, family relationships, academic performance, dating, intimacy, and sexual concerns. While students' visits with counselors are usually by appointment, a walk-in consultation service is provided two hours each weekday for students with urgent personal concerns.

Each year CAPS offers a series of self-development seminars focusing on skills development and special interests. These explore such interests as stress manage-

ment, assertiveness training, career planning, couples' communication, and study skills. Interested students may call or come by CAPS for further information.

As Duke's center for administration of national testing programs, CAPS also offers a wide variety of graduate/professional school admissions tests and professional licensure and certification examinations. The staff is also available to the entire University community for consultation and educational activities in student development and mental health issues affecting not only individual students but the campus community as a whole. They work with campus personnel, including administrators, faculty, student health staff, religious life staff, resident advisers, and student groups, in meeting needs identified through such liaisons. Staff members are available to lead workshops and discussion groups on topics of interest to students.

CAPS maintains a policy of *strict confidentiality* concerning information about each student's contact with the CAPS staff. If a student desires that information be released to anyone, written authorization must be given by the student for such release.

There are no charges for initial evaluation, brief counseling/psychotherapy, or self-development seminars. If appropriate, referral may be made to other staff members or a wide variety of local resources.

Appointments may be made by calling 684-5100 or coming by the office in 214 Old Chemistry Building, West Campus, between 8:00 A.M. and 5:00 P.M. Monday through Friday. If a student's concern needs immediate attention, this urgency should be made known to the secretary, and every effort will be made to arrange for the student to talk with a staff member at the earliest possible time.

Academic Procedures and Information



Registration

All students enrolled in the Fuqua School of Business must register each semester until all degree requirements are completed. After receiving notification of admission to the school and returning a statement of acceptance of admission, the student must register for the term indicated in the admission letter. New matriculants register during orientation week at the designated times. Each student must complete a course card listing the course work to be taken during the semester and obtain the approval of the appropriate program director. The student then presents this course card to registration officials for enrollment in the selected courses. After the first registration, a student must register for subsequent semesters at the regular stated time for registration. Currently enrolled students who fail to register at the first scheduled registration period for the subsequent semester incur a penalty for late registration.

Late Registration. All students are expected to register at the times specified by the University. A late registration fee of \$25 is charged any student registering late.

Change of Registration. During the first *two weeks* of the semester, registration may be changed with the approval of the Program Director.

Academic Requirements for the M.B.A. Program

Grading. The grading scale for M.B.A. students is: Superior Pass (*SP*)—4.0; High Pass (*HP*)—3.5; Pass (*P*)—3.0; Low Pass (*LP*)—2.5; and Fail (*F*)—0.0. The grading scale for Pass/Fail courses is: Credit (*CR*); and No Credit (*NC*).

Continuation Requirements. An M.B.A. student may proceed to the second year of the program only by successfully completing all first year courses with a grade point average of at least 3.0.

Any student who receives a grade of Fail (*F*), or a grade point average of less than 3.0 will be reviewed by the faculty members of the Curriculum Committee. These grades may be sufficient for the committee to recommend to the faculty that the student be terminated from the program.

Graduation Requirements. An M.B.A. student may be graduated only by successfully completing all program requirements and by receiving a grade point average of at least 3.0.

Exemptions. Students seeking an exemption from any course, curricular requirement, or other requirement of the Fuqua School of Business must submit a formal request to the Director of the M.B.A. Program. Exemption from a required course

may be secured by passing an exemption examination in the subject matter of that course.

Standards of Conduct. Duke University expects and will require of all its students cooperation in developing and maintaining high standards of scholarship and conduct. The University wishes to emphasize its policy that all students are subject to the rules and regulations of the University currently in effect or which are put into effect from time to time by the appropriate authorities of the University.

Any student in accepting admission indicates a willingness to subscribe to, and be governed by, these rules and regulations and acknowledges the right of the University to take such disciplinary action, including suspension and/or expulsion, as may be deemed appropriate, for failure to abide by such rules and regulations or for conduct adjudged unsatisfactory or detrimental to the University.

Commencement

Graduation exercises are held once a year in May. At this time degrees are conferred and diplomas are issued to those who have completed requirements by the end of the spring semester.

Those who complete degree requirements at the end of the fall semester or by the end of a summer term receive diplomas dated December 30 or September 1, respectively. There is a delay of about one month in the mailing of September and December diplomas because diplomas cannot be issued until they are approved by the Academic Council and the Board of Trustees.



Other Information

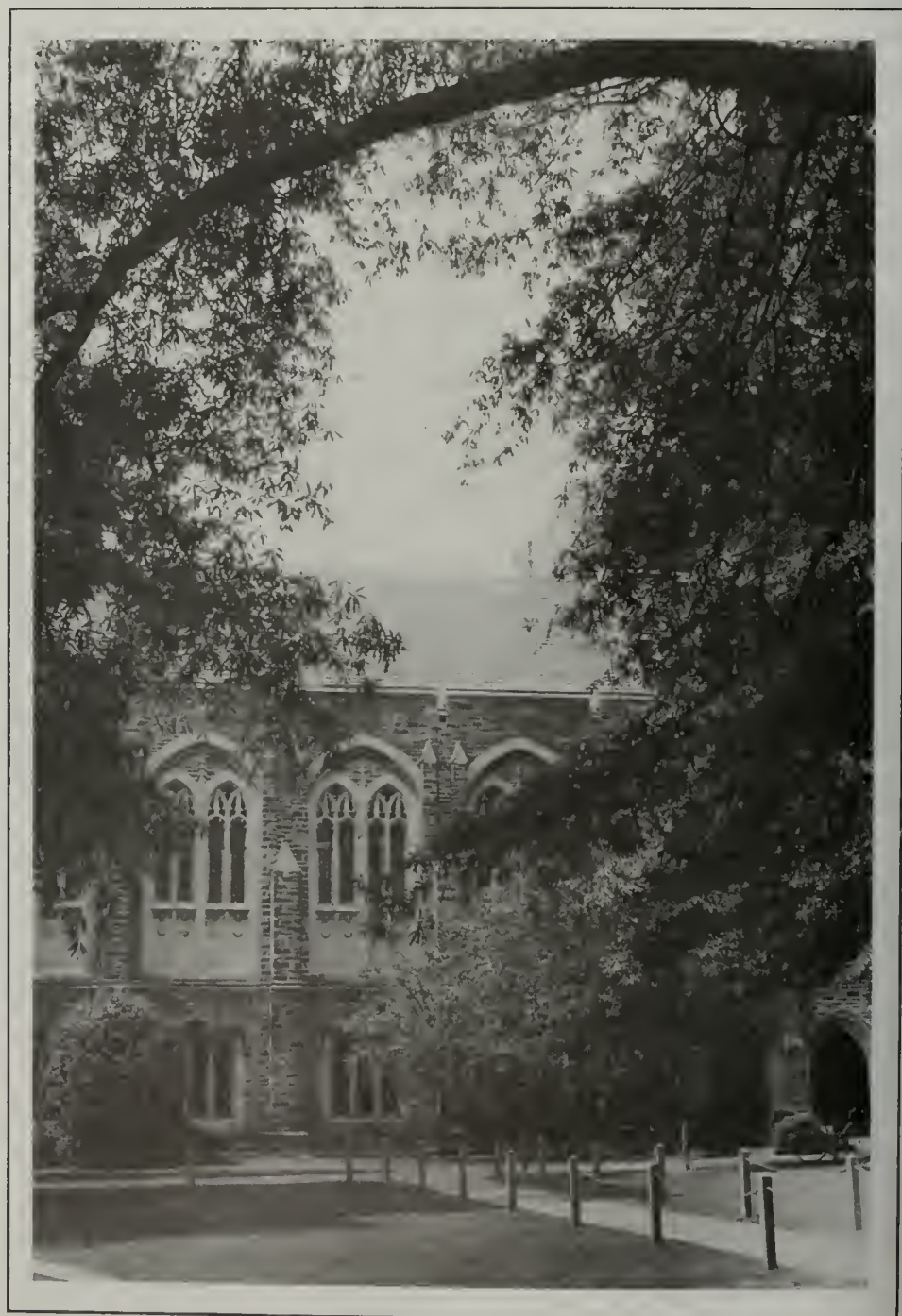
Student Records. Duke University adheres to a policy permitting students access to their student records, with the exception of confidential letters of recommendation received prior to January 1, 1975, and certain confidential financial information. Students may request review of any information which is contained in their student records and may challenge the content of their records by appropriate procedures. An explanation of the complete policy on student records may be obtained from the Associate Registrar.

No information contained in student records (academic or otherwise) is released to persons outside the University or to unauthorized persons on the campus, without the consent of the student. A student grants consent by signing a form which authorizes the release of data. Specific consent is required for the release of information to any person or organization outside the University, and it is the responsibility of the student to provide the necessary authorization and consent.

Reciprocal Agreements with Neighboring Universities. Under a plan of cooperation between Duke University and the University of North Carolina at Chapel Hill, North Carolina Central University in Durham, and North Carolina State University at Raleigh, students properly enrolled in the Fuqua School of Business during the regular academic year, and paying full fees to this institution, may be admitted to a maximum of two courses per semester at one of the other institutions in the cooperative plan. Under the same arrangements, students in the graduate schools in the neighboring institutions may be admitted to course work at Duke University. All interinstitutional registrations involving extra-fee courses or special fees required of all students will be made at the expense of the student and will not be considered a part of the Duke University tuition coverage.

Identification Cards. Graduate students are issued two-part identification cards which they should carry at all times. The cards are the means of identification for library privileges, athletic events, and other University functions or services open to them as University students. Students will be expected to present their cards on request to any University official or employee. The cards are not transferable, and fraudulent use may result in loss of student privileges or suspension. A student should report the loss of a card immediately to the Registrar's office. The cost of a new identification card is \$5.

Courses of Instruction



Master of Business Administration

CORE COURSES—300 SERIES

These courses are required to be taken in the first year except for Business Policy and the Management Experience (BA 340) and one course in the environmental field (one of BA 302, BA 342, or BA 345), which are taken in the second year. Students passing exemption exams may substitute electives in their first year. Unless specified otherwise, each course is worth three units of credit.

300. Managerial Economics. Considers how the actions of business firms, consumers, and the government—operating within a price system in a decentralized market economy—answer such basic resource allocation questions as what will be produced, how will it be produced, who will consume what is produced, and what resources to divert from present consumption to increase future consumption. The impact of various types of market structures (such as perfect competition, monopoly, and oligopoly) on economic efficiency will be discussed. Provides the student with an ability to view resource allocation problems within a constrained optimization framework and with some practice in applying marginal analysis.

301. Economic Environment of the Firm. Develops the theoretical framework within which the determinants of economic aggregates such as gross national product, the rate of unemployment, and changes in price levels can be analyzed. The emphasis of the course is to provide the manager with the knowledge necessary for making and understanding forecasts of the macroeconomic environment. Both Keynesian and monetarist approaches are considered.

302. The Economics of Government Policy Toward Business. Provides the student with an understanding of how the firm interacts with other institutions in the economic environment. By examining both the theoretical and institutional framework of regulation, antitrust activities, and labor unions, the prospective manager will be better prepared to interact with noncorporate organizations. In addition, the course seeks to examine the role of the firm in the economy and the way in which it carries out its activities. Prerequisite: second-year standing in the M.B.A. program or consent of instructor.

311. Statistical Analysis for Management. Examines structures for managerial decision making under conditions of partial information and uncertainty. After developing a foundation in probability theory, the course extends this foundation to a

set of structures and methodologies for the analysis of decision problems. Included are topics in probability, classical inference, and multivariate analysis.

312. Quantitative Analysis for Management. Examines the principles and techniques of building quantitative models to aid managerial decision making. Special emphasis is placed on utilizing models for structuring and analyzing resource allocation problems and decision problems under uncertainty. Topics include linear programming, decision analysis, and simulation.

318. Computer Laboratory. Emphasizes the use of the computer for support of the decision-making process. Introduces computer technology, hardware, software, use of computer systems, library programs, and a computer programming language. Noncredit.

320. Organization Behavior. Provides a study of organizations and their environment and the social and psychological foundations necessary to understand the behavior of individuals within organized settings. Emphasis is given to managerial strategies which enhance organizational effectiveness. Topics include individual and small group behavior, goal setting and adaptation, organization structure, and leadership.

330. Financial Accounting. Introduces the student to the types of information requirements imposed on the firm by agencies in its environment and develops an understanding of the activities of the firm within the framework of a financial accounting system designed to satisfy these information requirements. Emphasis is given to the study of financial accounting, reporting, and measurement problems from a theoretical and an applied basis, using cases and topical problems in financial accounting as a foundation for the learning experience.

331. Managerial Accounting. Focuses primarily on managers who are users rather than preparers of accounting information. Examines the use of accounting information in its major functions of planning, control, and product costing. Specific topics include cost estimation, budgeting, standard costing, control and performance evaluation, cost allocation, information systems, data limitations, and rational decision making using accounting information.

340. Business Policy and the Management Experience. Enables the student to apply the skills obtained in earlier courses to problems of operating and managing a business enterprise. Student teams are responsible for the management of firms in a computerized simulation which duplicates the characteristics of a large, consumer-oriented industry. Decisions must be made concerning production, labor utilization, market research, advertising, allocation of sales force, financial operations, accounting, production scheduling and maintenance, procurement, and personnel. Each firm reports periodically to a board of directors composed of faculty and executives from the local business community. Prerequisite: second-year standing in the M.B.A. program or consent of the instructor.

342. The Firm in the Public Policy Process. Reviews the sources, direction, and process of government social initiatives as they affect business; the causes of public distrust and hostility toward business; social stereotypes of business; the process of policy-making. Cases of effective and ineffective participation in the public policy process are developed with specific emphasis on problems of political feasibility, internal organization, and future social issues that business should be aware of. Prerequisite: second-year standing in the M.B.A. program or consent of instructor.

345. Legal Environment of the Firm. Considers the legal environment of the firm with emphasis on the legal system, the process by which laws are formulated and changed, and the type and forms of legal constraints imposed on firms. Also

examined are major legislation, court cases, and regulation by federal agencies which affect the firm's decisions. Prerequisite: second-year standing in the M.B.A. program or consent of the instructor.

350. Financial Management. Focuses on the acquisition of financial resources from the external market and their effective utilization and control within the organization. Specific attention is given to capital markets, evaluation of the firm, short-run resource planning (cash, inventory, receivables, and short and intermediate-term financing), and long-run resource planning (investment in long-lived assets, leasing, debt and equity financing, dividend policy, and the cost of capital). Institutional aspects of financial markets are emphasized only to the extent that they provide necessary insights into the problems of planning financial strategy.

360. Marketing Management. Provides an overview of the marketing function in business firms by acquainting students with the fundamental issues and decisions involved in planning and managing marketing activities. Attention is given to the strategic marketing decisions of new product development, product policy, pricing, advertising and communications, marketing research, personal selling, and channels of distribution. Major emphasis is placed on developing an understanding of the underlying forces which influence marketing decisions, including buyer behavior, competitive marketing activity, organizational considerations, and governmental regulation.

370. Operations Management. Surveys issues in the design, operation, and control of the process by which goods are manufactured and services delivered. Specific topics of study include the analysis of different kinds of production processes, managing the workforce, planning production and managing materials, choosing new capacity, dealing with technological advance, dealing with vertical integration, and combining operations choices into a coherent strategy.

388. Business Communications. Constitutes a program in oral and written communication. It helps students develop the abilities to organize clearly and present effectively both written and oral reports. Noncredit.

ELECTIVE COURSES—400 SERIES

These courses are typically taken by students with second-year standing but may be taken earlier with permission of the instructor. These courses are generally offered each year, but there may be additions or deletions in response to student and faculty interest. Unless specified otherwise, each course is worth three units of credit.

400. Current Problems in Macroeconomics. Analyzes major issues and problems confronting macroeconomic policy makers. Included among the topics covered are inflation, economic growth, unemployment, and the choice of appropriate policies for economic stabilization. The emphasis of the course is in applying basic macroeconomic theory to actual problems to better understand the motivation behind economic policy. Extended policy cases are used as a basis for class discussions and individual student assignments.

410. Operations Research Applications. Deals with problems of organization for an operations research project, formulation of the problem, model construction, interpretation of analytical results, and implementation. Selected cases of particular applications of operations research from the literature serve as a basis for much of the class work. Students work in local industry, the University, the Medical Center, or in other cooperating agencies on operations research problems. Methodologically, some attention is devoted to advanced solution techniques as necessary to complete student projects, but primary attention is focused on formulation and use of models, the modification of existing models, or the development of new ones.

411. Operations Research Methods. Surveys the methodologies of operations research and shows how they can be applied to decision-making situations. The course will be primarily concerned with selecting which tool to use in various situations, rather than algorithm details. Topics to be covered include: dynamic programming, stochastic programming, integer programming, nonlinear programming, Markov chains, inventory theory, and linear model formulation.

412. Corporate Models and Forecasting. Examines corporate models as a key planning tool used by managers within a firm in planning the future of the company. This course discusses the theory and practice involved in developing a model of a firm or a business within the firm. Model formulation, estimation, and simulation are covered. The related topic of forecasting, an integral aspect of such models, is also examined.

413. Data Analysis. Confronts a variety of realistic situations amenable to statistical analysis, often requiring modification of the standard techniques described in introductory texts. The emphasis in the course is on problem solving, and the methods used range from formal parametric and nonparametric tests to informal judgments on patterns of data and relationships among variables. Students develop proficiency in the SAS language both for versatile data management and for report writing. A common core of topics such as regression analysis, nonparametric analysis, simulation, and data exploration and manipulation are studied by all participants. Additionally, each student is required to undertake a data analysis project and develop an ability to deal effectively with amounts of data too great to manage manually.

420. Organization and Information System Design. Examines the way to design organization structures and information systems. Modern firms are organized around their effectiveness in the creation and use of information. They use decision rules and information to coordinate decisions, control processes, and reward individuals. Examples are drawn from accounting, finance, marketing, and human resource management as well as policy issues. These area applications are implemented in firms with varying degrees of effectiveness and efficiency depending upon the organization structure, information system, and incentives. These relations are investigated in detail in the class through lecture/discussion and case studies and/or field studies. The field studies would emphasize organizational description and change to achieve increased performance.

422. Dynamics of Bargaining. Explores the processes of bargaining and negotiation; the dynamics of interpersonal and intergroup conflict; and understanding of theory and research related to processes of influence, negotiation, and conflict management. A second part will emphasize skill development through extensive case analysis, role playing, and simulation.

423. Human Resource Management. Provides an integrative and comprehensive understanding of issues and challenges involved in the management of human resources in contemporary, complex organizations. The topics discussed include employee selection and placement, training and development, compensation and reward systems, performance evaluation, career development, and human resource planning. The legal context of human resource practices is also addressed. Perspectives for this course are from the line or operating managers primarily. The role of the personnel department and the personnel specialists is evaluated in terms of their contribution to the human resource function within the operations of the line manager.

424. Leadership of Formal Organizations. Explores in some detail what is known and not known about leadership of organizations, and helps prospective managers

learn to think about their leadership behavior. The course will analyze current leadership theories, probe the nature of managerial work, and examine some of the primary roles leaders have to play in organizations. Class members will take and receive feedback on a number of leadership questionnaires, participate as managers in an organizational simulation, and examine their vocational interests as they relate to managerial work.

425. Managerial Decision Processes. Explores in detail what is known about the processes of decision making. The focus is on the ability of individuals to process information in complex situations. However, decision making by small groups and organizations will be considered. Examples of decision research will be drawn from the areas of accounting, finance, marketing, and human resource management. The course also explores the implications of behavioral decision research for the design of managerial decision aids. Of particular interest will be tools of decision analysis and computer-based decision support systems.

426. Multidivisional Firm Structure and Strategy. Examines the structure and strategy relationship of the large multidivisional firm to assess the strengths and weaknesses of various organizational forms in terms of economic performance. Topics include: structure follows strategy, strategy follows structure, the counter proposal, choosing organizational/environmental boundaries, divisionalization of the large firm, and planning, incentives, and information for coordinated decentralization. The course work includes readings, cases, and examination of current large firm structure and strategy changes.

427. Industrial Relations. Introduces students to the concept of an industrial relations system and the constraints that the choice of such a system places on a manager. The course begins with an in-depth analysis of the traditional North American unionized system, moves through the means by which this system is presently evolving, and concludes with a survey of some alternative systems. This course uses a union model as a means of introducing issues relevant to all industrial relations systems.

428. Organizing for Innovative Technology and Research. Focuses on evolving enterprises whose primary activity is the technology of new knowledge or information. These enterprises include technology development, research, consulting, and new product firms. The perspective is the management of an array of projects in various stages: conception, growth, maturity, and decline. Topics include project selection, project management, project termination, firm-level issues in manpower and resource allocation among projects, budgeting, productivity measurement and enhancement, conflict and coordination among organizational subunits, designing incentives and rewards for engendering new ideas, and risk taking. The course will use a combination of readings, lecture/discussions, cases, and outside lectures. Students will be encouraged to do field studies.

430. Financial Accounting Standards and Analysis I. Examines problems of asset and liability valuation and the related issues of income determination from the perspective of the professional accountant. The information needs of financial statement users are emphasized. Frequent reference is made to professional accounting pronouncements. Prerequisite: M.B.A. standing, one course in financial accounting, and one course in managerial accounting.

431. Financial Accounting Standards and Analysis II. Considers issues regarding ownership equities and the related problems of income determination from the perspective of the professional accountant. Specific attention is devoted to the accounting and reporting problems of complex corporate enterprises. The course em-

phasizes the information needs of financial statement users. Frequent reference is made to professional accounting pronouncements. Prerequisite: BA 430.

432. Accounting for Not-for-Profit Organizations. Studies the information needs and principles of measurement of activities of organizations whose goals are specified in terms other than profit maximization.

433. Management Planning and Control. Examines recent developments in the use of managerial accounting information with regard to the areas of management planning and control. Advanced topics will be approached from an applications orientation.

434. Corporate Financial Reporting. Focuses on significant issues of interest to users of publicly available accounting information, including financial statements. Issues of current interest in the valuation of assets and liabilities and income determination are considered. Emphasis is placed on the effects of alternative accounting measurement and reporting procedures on users' decision models. Credit is not given for both BA 430 and BA 434.

435. Management Information and Control Systems. Focuses on the set of problems associated with the design and operation of the information systems necessary to support strategic planning of an organization and to support the organization's control system. Specific attention is given to the role of information in planning and control, the economics of information, the dynamics of information flows, technologies of information systems, information system design, data base construction and maintenance, and reporting systems.

436. Internal Control, Auditing, and Information Systems Analysis. Studies the techniques available to evaluate the reliability of an existing information system. An evaluation is made of information flows, aggregation techniques and other topics necessary to evaluate the credibility of information reported from a particular data gathering system. Topics include audit objectives from an internal and external standpoint, cost of information, standards, and other topics relevant to both internal and external auditing problems.

437. Financial Statement Analysis. Explores the use of financial statement information within the context of modern finance and accounting research. Empirical studies are introduced to demonstrate how financial statement data interface with nonaccounting data such as stock prices, industry factors, and macroeconomic variables. Major topics include the statistical properties of accounting numbers in time-series and cross-sectional analyses, the role of financial statement information in efficient capital markets and in portfolio decisions, and the association between accounting numbers and security returns. The course also examines financial information used in credit granting decisions and in predicting bond ratings and bankruptcy.

438. Financial Accounting Seminar. Treats advanced topics in financial accounting. Prerequisite: second-year standing in the M.B.A. program and BA 431 or BA 434.

440. Corporate Strategy and Public Policy. Examines the major phases of the strategic planning process in business firms and with the manner in which business firms can affect public policy. Considerations involving the various functional areas of management are synthesized to permit executives to make meaningful decisions concerning the product-market posture of the firm. Examples of the topics covered include: formulation of goals, analysis of the external environment, bottom-up and top-down planning, coordination and control, management objectives and responsibilities, and the role of business firms in influencing public policy.

441. Analytical Approaches to Corporate Strategy and Public Policy. Develops structured frameworks for viewing the various problems inherent in the process of formulating, implementing, and monitoring both internal and external aspects of strategy in modern business firms. Relevant considerations in the strategic planning process and the influencing of public policy are identified, and the manner in which form models and data bases can prove useful to executives in dealing with various subproblems is discussed. Real world cases will be used to discuss such topics as: the nature of formal planning systems, uses and limitation of management science models, available data bases, sources of information for environmental analyses, and methodologies for public policy analyses. Corequisite: BA 440.

442. Entrepreneurship and New Venture Management. Focuses on the formulation and strategies for implementation of a new business venture. It is a course designed to expose students to an alternative career as independent business men and women. Entrepreneurs who have succeeded and failed will assist the students in developing and evaluating their new venture ideas.

445. Business Planning. Presents corporate, security, and tax issues for analysis and resolution through examining a series of problems involving common business transactions. The problems will include such topics as the formation of closely-held and public corporations, stock redemption, the sale of a business, merger and other types of combination transactions, and recapitalization, division, and dissolution of corporations.

446. Federal Income Taxation. Deals with the basic concepts of federal income taxation with emphasis on gross income inclusions and exclusions, deductions, credits, and computations of gain, loss, and basis upon dispositions of property.

450. Short-Run Financial Management. Examines the financial management and control of a firm's short-term assets and liabilities. Topics include cash management, management of the firm's short-term investment/borrowing portfolio, receivables management, and management of the firm's bank relationships.

451. Long-Term Financial Management. Deals with the long-term financing and investment decisions of the firm. Special attention will be given to the valuation of corporate securities, capital structure theory and policy, capital budgeting, corporate planning models, and analysis of the firm's cost of capital.

452. Money and Capital Markets. Considers the structure and behavior of capital markets. The course includes a discussion of the institutional framework of the American capital market as well as the major international markets, although the emphasis is on the theoretical foundation for analyzing interest rates and funds flow in those financial markets. Included among the topics is an extended discussion of monetary theory, the term structure of interest rates, and the analysis of risk in financial markets.

453. Investment Analysis and Portfolio Management. Focuses on the problems of selecting individual security issues for investment and the construction, management, and performance evaluation of portfolios. Topics that are covered include the structure and operations of securities markets, the behavior of security prices, the analysis and valuation of various types of securities, and the implementation of portfolio and capital market frameworks and tools for analysis.

454. Management of Financial Institutions. Explores various ways in which management science techniques can be applied to the management problems of financial institutions, especially commercial banks. The course will examine several types of financial institutions, consider the role that they play in the American economy, and focus on the use of management science techniques for helping executives cope with planning, decision making, and control problems.

455. Futures and Options Markets. Focuses on the use of futures and option contracts in the financial management of corporations and the management of security portfolios. In the futures area emphasis is placed on interest rate futures, currency futures, and stock index futures. General pricing of agricultural futures is also studied as well as the use of agricultural and other contracts in diversifying security portfolios. In the options area, emphasis is placed on the use of stock options in the financial management of stock portfolios. Also, interest rate options and the use of option pricing models in the formulation of optimal option investment strategies are studied.

460. Advanced Marketing Strategy. Considers in greater depth the process of strategic planning in the marketing function and its relation to corporate strategy. Offers an opportunity to sharpen and extend analytical skills in marketing as well as to synthesize understanding of the managerial, organizational, and environmental aspects of marketing activity.

461. Marketing Research. Considers the process of identifying and generating information from research as input to marketing decision making. Emphasis given to the perspective of the marketing manager in determining whether additional information is needed and, if so, how appropriate information should be acquired. Topics include problem definition, research budgeting, research designs, (survey, observational, experimental), sampling, methods of data collection, data analysis, and interpretation.

462. Consumer and Buyer Behavior. Provides an opportunity for advanced study of the behavior of buyers of consumer and industrial goods/services. Objectives include (1) increasing the prospective manager's sensitivity to and understanding of buyers and the psychological, sociological, and anthropological forces which shape their behavior, and (2) enabling the student to apply this knowledge in arriving at improved marketing decisions.

463. Advertising Management. Deals with issues and problems in planning and controlling advertising activities in the firm, largely from the perspective of product managers and general marketing managers who must develop strategies for communicating with customers and other important publics of the firm. Attention is devoted to the setting of advertising objectives, budget appropriation, copy/message strategy, media strategy, advertising research and evaluation, and government regulation. Emphasis is placed upon behavioral analysis of target audience utilizing social-psychological and communication theories.

464. Product Management. Develops further insights into the process and policies which guide the firm's offering of products to the market place. Topics include the problem of merging market needs with corporate resources; product concept and positioning; systematic approaches to new product development; branding; packaging; product abandonment. The basic point of view is strategic in that product decisions are an integral part of overall marketing strategy decisions. Interfunctional management aspects are also considered.

465. Marketing to Business. Provides students with the conceptual foundations and analytical techniques used in marketing products and services to business. Techniques such as value and input-output analysis, formulation of the buying center, optimal bidding models, and segmenting of markets by Standard Industrial Classification (S.I.C.) are explored as ways to respond to the needs of the industrial buyer. The course work includes cases, readings, and a project by students researching an ongoing firm that markets its products to businesses.

470. Operations Planning and Control. Examines detailed tactical problems facing operating managers. The emphasis is on specific planning and control problems

and on techniques for solving them. Topics include: materials planning and inventory control, aggregate and detailed scheduling, robotics, productivity, manufacturing software packages, maintenance, and quality control.

471. Manufacturing Strategy. Investigates the strategic operating policy options available to manufacturing companies, with the goal of learning why some companies' manufacturing operations are a greater competitive threat than others. The concept of factory focus will be examined in detail and aspects of the Japanese philosophy of manufacturing will be explored. The remaining three-fourths of the course will take three different, and distinct, approaches to strategic issues. The first is an "industry" approach where different manufacturing strategies prevailing within a particular industry will be examined. The second is a "decision" approach where company handling of a specific type of decision (e.g., new capacity, vertical integration, process modernization) will be contrasted across industries. The third is an "external environment" approach where the impact on manufacturing of a particular regulation, energy price inflation, will be assessed.

472. Operations Management in the Service Sector. Examines the strategic and tactical problems associated with the management of service systems such as hospitals, police departments, banks, airlines, hotels, restaurants, and insurance companies. The course focuses on designing or improving service delivery systems.

473. Management of Technology. Examines the role of technological changes in improving productivity and in developing new products and services. The process of introducing new technology to the firm's production system is explored, along with issues in the management of research and development. Other topics include adaptation strategies, technology transfer, technology assessment/forecasting, and government policies toward technology and innovation. Organization contexts include manufacturing, services, hospitals and public agencies.

480. The International Environment. Examines the environment in which multinational firms operate. It includes a discussion of current policy issues such as balance of payments, trade policy, and economic development. Special emphasis is given to the theory of the multinational firm and its role as a participant on the economic scene. That role is evaluated from the perspective of both the firm itself and the countries in which the firm operates.

481. International Business. Introduces the prospective manager to the set of problems unique to operating in an international environment. The problems are selected from a broad range of functional areas, and include such topics as the life cycle theory of product marketing, plant location, and technology choice for production with labor forces of diverse backgrounds.

482. International Finance. Provides the background necessary to recognize and analyze the financial problems facing a firm that operates in an international environment. This will be accomplished by developing a theoretical framework which describes the international environment and using that as background, studying specific financial problems related to multinational business.

490. The Practicum. Gives the student a significant experience in applying the concepts, theories, and methods of analysis learned in the program to a real, complex problem of an economic enterprise. It should include the analysis of a situation and the explicit formulation of a problem. The important task of identifying and specifying the problem is an integral part of the course. The practicum report should propose a solution to the problem and should contain the supporting explanation and logic. The solution should be one that can be implemented, not requiring unavailable resources. Prerequisite: second-year standing in the M.B.A. program and consent of the Director of the M.B.A. Program and instructor.

491.1-9. Special Topics in Management. Permit the study of special topics in management on an occasional basis depending on the availability and interests of students and faculty. Examples of special topics include logistics management, organizations and their environment, innovation and change, current problems in personnel, special topics in finance, and operations research and public policy. Prerequisite: second-year standing in the M.B.A. program or consent of instructor.

499. Independent Study. Allows the student an opportunity to engage in a study of special topics on an individual basis under the supervision of a faculty member. Prerequisite: second-year standing in the M.B.A. program and consent of the Director of the M.B.A. Program and instructor.

Doctor of Philosophy

These 500-level courses are available for Ph.D. students and qualified M.B.A.'s in the areas of accounting, marketing, operations management, finance, and organizational behavior. Typically one in each area will be offered each year. These courses are open to M.B.A. students desiring rigorous depth in an area with permission of the instructor. Unless specified otherwise, each course is worth three units of credit.

531. Financial Accounting Seminar. Examines the nature of published financial statement information and its relationship with various economic variables. The list of related variables might include stock market data, bankruptcy filings, and the actions of various users of financial statement information, including management, investors, creditors, and regulators. The focus is on the current research methodologies and research efforts used to analyze the above relationships, as well as consideration of the underlying theoretical concepts. A background in masters-level accounting and finance is assumed.

532. Management Accounting Seminar. Examines information systems and their use in facilitating management decision making and organizational control. Emphasis will be placed on the appropriate research methodologies and paradigms including information economics, decision theory, and organizational theory. Topics include but are not limited to budgeting, incentive systems/performance evaluation, variance investigation, and cost allocation.

541. Organization Seminar—A Micro Focus. Focuses on individual and small group behavior in organizations. Theories of motivation, decision making, interpersonal behavior, group processes, and leadership are discussed. The course emphasizes a variety of research approaches and methods. The course will also include presentation of behavioral research by members of the Fuqua School of Business and by other researchers.

542. Organization Seminar—A Macro Focus. Focuses on the organization and the sub units which make up the organization. Theories of organization, structure, decentralization, divisionalization, functional area integration, task design, incentives and rewards, information systems, and decision rules are discussed. These issues are developed with an orientation toward their choice and design for high performance. Throughout the course, there is an emphasis on appropriate research approaches and methods to investigate theoretical issues in various research settings. The course will also include presentation of research by members of the Fuqua School of Business and by other researchers.

551. Corporate Finance Seminars. Introduces the student to research areas in corporate finance. The emphasis of the course will depend on the research interests of the instructor, with one or more of the following topic areas to be explored in depth: capital budgeting, capital structure, mergers and acquisitions, financing alternatives,

dividend policy, valuation methods, cost of capital, international finance, and cash management.

552. Investment Seminar. Surveys research in the investment area and explores in depth one or more problems in which research is currently active. The emphasis will be determined by the instructor from one or more of the following areas: valuation of risky securities, capital asset pricing model and extensions, capital market efficiency, portfolio theory, options and warrants, investment management, microstructure of security markets, and futures contracts.

561. Seminar in Quantitative Research in Marketing. Presents an overview of the quantitative techniques which are important in marketing research. Each model and technique will be examined in considerable detail so as to permit an understanding of its assumptions, structure, and usefulness. Topics covered will include the general data analysis techniques as well as models from advertising, new products, and pricing decisions.

562. Seminar in Behavioral Models in Marketing. Examines the development of research in consumer behavior. Major emphasis is given to theoretical developments and empirical research. Students are expected to formulate and test a framework or model of consumer behavior with respect to a marketing problem or topic.

571. Operations Strategy Seminar. Pursues the latest developments in the strategy of operations in both the manufacturing and service sectors. Topics include the focused factory concept, Japanese manufacturing philosophy, technological policy toward new process development and toward new product introduction, vertical integration, choice of capacity and location, industry analysis, and the impact of government regulation. The seminar emphasizes the development of hypotheses about strategic topics and the empirical means by which they can be tested.

572. Seminar in Operational and Technological Tactics. Examines current issues in the day-to-day management of manufacturing and service delivery systems. Topics include material requirements planning, capacity requirements planning, quality of work life projects, productivity measurement and enhancement, implementation of new product introductions and production process modifications, quality assurance, production planning and scheduling, and logistics. The seminar concentrates on (1) the substance of recent developments, (2) the generation and test of hypotheses about tactical issues, and (3) the applicability of various optimization techniques to the advance of operation tactics.

Faculty



Faculty

The faculty of the Fuqua School of Business has a diverse educational and professional background. This diversity provides students with the opportunity to explore wide-ranging aspects of the environment in which they will live and work after completing their educational experience.

The student-faculty ratio in the school is maintained at a level permitting development of close professional relationships and encouraging individual assistance in academic and professional relationships. The student-teaching faculty ratio is about seven to one. In addition, faculty engaged in major research projects and other teaching assignments are available to work with students. This balance is advantageous for both students and faculty in their joint work.

A brief description of the background and main areas of interest of the faculty follows:

Helmy H. Baligh, Ph.D., *Professor of Business Administration*; B.A. (Oxford University), M.B.A., Ph.D. (University of California, Berkeley).

Professor Baligh joined the Duke faculty after teaching at the University of Illinois. His major research is in the analysis and design of economic structures for both business and social purposes. He has participated in the development of the Master of Business Administration programs at Duke and at the University of Illinois with emphasis on curriculum. His publications include *Vertical Market Structures* (with Leon E. Richartz) and several articles in the areas of transportation, hospital administration, marketing, economics, and organization structure design. He teaches in the fields of marketing, economic decision making, and organization design.

Joseph Battle, Ph.D., *Associate Professor of Business Administration*; B.S. (North Carolina Central University), M.S., Ph.D. (University of Michigan).

After serving as Special Assistant to the President of Shaw University, Professor Battle joined the Duke faculty, teaching in the areas of mathematics, probability and statistics, and economics. Research and consulting interests include the evaluation of federally funded poverty agencies with the Research Triangle Institute and local Durham organizations.

James R. Bettman, Ph.D., *IBM Research Professor of Business Administration*; B.A., M.Phil., Ph.D. (Yale University).

Prior to joining the Fuqua School of Business, Professor Bettman taught at the Graduate School of Management, University of California, Los Angeles. He is the author of *An Information Processing Theory of Consumer Choice* as well as numerous articles in academic journals. Professor Bettman has also served as a consultant to government agencies, as a member of editorial boards of scholarly publications, and as a participant in numerous forums.

Colin C. Blaydon, Ph.D., *Professor of Public Policy Studies, Professor of Business Administration, and Vice-Provost for Academic Policy and Planning*; B.E.E. (University of Virginia), Ph.D. (Harvard University).

Professor Blaydon has taught in the areas of corporate finance, managerial economics, and operations research. He also worked for the Office of Management and Budget in policy formulation and implemen-

tation in pension reform, health manpower, national health insurance, and housing finance. His current research is involved with social security and pension plans.

Marian C. Burke, Ph.D., *Assistant Professor of Business Administration; B.A. (College of William and Mary), M.S. (Virginia Commonwealth University), Ph.D. (University of California, Los Angeles).*

Professor Burke's teaching interests include marketing strategy and planning, advertising management, and marketing management. Her current research activities are focused on an examination of the decision rules used by marketing managers in selecting strategic objectives on issues of advertising effectiveness, and on consumer information processing strategies.

Richard M. Burton, D.B.A., *Associate Professor of Business Administration and Area Coordinator for Organizational Behavior; B.S., M.B.A., D.B.A. (University of Illinois).*

Professor Burton's primary research interests are in the design and management of organizations. His research is concerned with the design of the firm for coordinated operations across the functional areas of marketing, strategy, production, finance, and information systems. He teaches courses in organization design, management of innovation and research, and corporate structure and planning. Recent consulting experience includes projects for SIECOR and Bell Canada.

Robert J. Capettini, Ph.D., CPA, *Associate Professor of Business Administration; B.B.A., M.B.A., (University of Toledo), Ph.D. (University of Illinois).*

Prior to joining the Duke faculty, Professor Capettini taught at the University of Iowa. His research interests are in the area of managerial accounting applications of quantitative and behavioral decision models and cost estimation and control in the health care field.

Kalman J. Cohen, Ph.D., *Distinguished Bank Research Professor; B.A. (Reed College), M.Litt. (Oxford University), M.S., Ph.D. (Carnegie-Mellon University).*

Prior to joining the Duke faculty, Professor Cohen served for two years as Distinguished Professor of Finance and Economics and as the first Director of the Salomon Brothers Center for the Study of Financial Institutions at New York University. He also spent fourteen years on the faculty of Carnegie-Mellon University's Graduate School of Industrial Administration. He has written six books and over eighty articles in the areas of banking and finance, strategic planning, economics, management science, and computer simulation. He has pioneered in the applications of management science techniques in banking; his current research focuses on the microstructure of security markets.

Robert M. Conroy, Ph.D., *Assistant Professor of Business Administration; A.B. (Rutgers College), M.B.A. (University of Connecticut), Ph.D. (Indiana University).*

Professor Conroy joined the Fuqua School of Business in September, 1981 after teaching for a year in the Graduate School of Business Administration at Indiana University. He has taught courses in both corporate finance and investments and has done research on the effect of market structure on the performance of capital markets.

Ellen F. Cox, Ph.D., *Assistant Professor of Business Administration; B.A. (University of Santa Clara), M.B.A., Ph.D. (University of California, Berkeley).*

Professor Cox teaches in the area of financial accounting. Her current research interests include the impact of information on security prices, accounting policy formulation, and auditor liability.

David C. Dellinger, Ph.D., *Associate Professor of Business Administration; B.S. (Duke University), M.S., Ph.D. (Stanford University).*

Professor Dellinger's current research involves developing cost-effectiveness methodology for evaluating programs of care for the aged. This research is sponsored by the Duke Center for the Study of Aging and Human Development in which he is a senior fellow. He has also done consulting work for the United States Senate Committee on Armed Services dealing with Officer Manpower Management Systems. His teaching fields include operations research and economics, and he has been active in curriculum development with the Duke Master of Business Administration Program.

David A. Dittman, Ph.D., *Associate Professor of Business Administration and Area Coordinator for Accounting; B.B.A. (University of Notre Dame), M.A., Ph.D. (Ohio State University).*

Professor Dittman teaches managerial accounting as it applies in both business and health care organizations. His research interest centers on the generation, use, and impact of accounting data on managerial decisions. He has published numerous articles in leading accounting and health care management journals. Professor Dittman taught at Northwestern University for five years before joining the Fuqua faculty in 1978. His current research interest centers on the efforts of federal regulation upon the health care systems in the United States. He is consultant to several hospitals and professional health care associations. He recently coauthored a book entitled, *Hospital Cost Containment Programs: A Policy Analysis*. He is Director of the Center for the Study of Accounting. He is a member of the American Accounting Association's Advisory Committee on Accounting Education.

Julie A. Edell, Ph.D., *Assistant Professor of Business Administration*; B.A. (University of Nebraska), M.S., Ph.D. (Carnegie-Mellon University).

Professor Edell's teaching interests are in the area of marketing, with emphasis on advertising, marketing management, consumer behavior, and marketing research. Her current research is concerned with examining the effect of advertising communications upon consumer purchase behavior.

John D. Forsyth, D.B.A., *Professor of Business Administration and Director of the E.M.B.A. Program*; B.A. (Queen's University), M.B.A. (University of Detroit), D.B.A. (University of Illinois).

Prior to coming to Duke, Professor Forsyth was Professor of Business Administration and Director of the Program for Executive Development at IMEDE Management Development Institute in Lausanne, Switzerland. His teaching and research interests are in the areas of international financial management and the planning and control of capital investments.

Grant W. Gardner, Ph.D., *Assistant Professor in Business Administration*; B.S. (Southern Methodist University), A.M., Ph.D. (Harvard University).

Professor Gardner's primary areas of research are macroeconomics and international economics. His current research interest is central bank policy in an open economy. He teaches macroeconomics and international trade.

W. Clay Hamner, D.B.A., *Professor of Business Administration*; B.B.A., M.A. (University of Georgia), D.B.A. (Indiana University).

Professor Hamner teaches in the areas of organizational behavior, personnel management, and new venture management. He has published over thirty articles in the areas of bargaining strategies, applied motivation theories, equal employment opportunity, and predicting unionization. He has also consulted in these same areas for such companies as Sears, Marathon Oil Company, Clark Equipment, Pepsi, Chemical Bank, and the U.S. Savings Loan League among others. Prior to coming to Duke University, Professor Hamner taught at Indiana University and Northwestern University. Professor Hamner is the coauthor of six textbooks in the field of organizational behavior and personnel management.

Christine R. Hekman, Ph.D., *Assistant Professor of Business Administration*; B.S. (Valparaiso University); Ph.D. (University of Chicago).

Professor Hekman joined the Fuqua School of Business in September, 1981. She previously taught at the Harvard Business School for six years. Her primary field of interest is in the area of international finance, but she also has worked in corporate finance.

Robert E. Hoskin, Ph.D., *Assistant Professor of Business Administration*; B.S. (Ohio State University), M.S. (Bowling Green State University), M.A., Ph.D. (Cornell University).

Professor Hoskin joined the Fuqua School of Business in September, 1980. His teaching interest is in the area of financial accounting. He has published in *Financial Management* and the *Journal of Accounting Research* and serves on the editorial board of the *Accounting Review*. Professor Hoskin's research interests currently include behavioral decision theory and inflation accounting.

Joel C. Huber, Ph.D., *Associate Professor of Business Administration*; B.A. (Princeton University), M.B.A. (Wharton Graduate Division, University of Pennsylvania), Ph.D. (University of Pennsylvania).

Professor Huber comes to the Fuqua School of Business from the Business School at Columbia University and the Krannert Graduate School of Management, Purdue University. His teaching interests are in the areas of marketing and market research. He is a member of the American Marketing Association, the Association for Consumer Research, and the Psychometric Society.

John S. Hughes, Ph.D., CPA, *Associate Professor of Business Administration*; B.S./B.A. (Northeastern University), M.S. (University of Massachusetts), Ph.D. (Purdue University).

Prior to coming to Duke, Professor Hughes was on the faculty of the Amos Tuck School of Business, Dartmouth College. In addition to his primary discipline of accounting, he also has research interests in finance and management science. His publications include articles in several leading journals. He is an associate editor for the *Journal of Accounting and Economics* and a former editorial consultant for the *Accounting Review* and a referee for several leading journals. His teaching interests are in financial accounting and applied statistics.

Kirk R. Karwan, Ph.D., *Assistant Professor of Business Administration*; B.E.S., M.S.E. (The Johns Hopkins University), Ph.D. (Carnegie-Mellon University).

Professor Karwan served previously on the faculty of the School of Business at Tulane University where he taught courses in management science and management information systems. His research interests concern the use of quantitative techniques and computers as aids in decision making. He has published articles that deal with a variety of problem areas including environmental protection, financial planning, and emergency management. He presently is involved in research in the area of decision support systems.

Thomas F. Keller, Ph.D., CPA, Dean and R. J. Reynolds Industries Professor of Business Administration; A.B. (Duke University), M.B.A., Ph.D. (University of Michigan).

Professor Keller specializes in accounting. His current research and teaching interests are principally in the areas of financial accounting and reporting. He has held several offices in the American Accounting Association, including Editor of the *Accounting Review* (1972-75). He is the coauthor and coeditor of several books in financial accounting. During the summer and fall of 1975 under the auspices of a Fulbright grant, he lectured in Australia and the Far East on a variety of topics related to the development of accounting theory and standards.

Dan J. Laughhunn, D.B.A, Professor of Business Administration and Area Coordinator for Quantitative Methods and Operations Management. B.S. (Engineering Mechanics), M.B.A., D.B.A. (University of Illinois).

Professor Laughhunn has served as a consultant to industry and universities on a variety of topics related to planning and budgeting. His teaching and research interests deal with the application of quantitative techniques to problems in production and finance. Professor Laughhunn also has been actively engaged in teaching executive development programs, both at Duke and at other universities.

Roy J. Lewicki, Ph.D., Associate Dean for Academic Programs and Associate Professor of Business Administration; A.B. (Dartmouth College), Ph.D. (Columbia University).

Professor Lewicki teaches in the areas of organizational behavior and managerial psychology, with particular emphasis on bargaining and negotiation, conflict management, and small group dynamics. Professor Lewicki is the coauthor of several books and numerous articles on conflict management, negotiation, and organizational change. He has previously served as the Director of the M.B.A. Program at Duke and on the editorial board of *Exchange*. He is a frequent contributor to executive development programs for major banks, professional associations, and corporations.

Arie Y. Lewin, Ph.D., Professor of Business Administration; B.S., M.S. (University of California, Los Angeles), M.S., Ph.D. (Carnegie-Mellon University).

Prior to coming to Duke, Professor Lewin was on the faculty of New York University for eight years. His research interests have been focused on applications of behavioral science to specific functional areas, organization design, person perception, and business participation in the formulation of public policy. Current research involves new approaches to measuring the effectiveness and efficiency of organizations and organization redesign, state owned enterprises in international trade, and the social, legal, and political environment of business. Professor Lewin is the coauthor of three books and his papers have appeared in numerous academic journals. Professor Lewin is the Organization Design Department Editor of *Management Science*.

John M. McCann, Ph.D., Associate Professor of Business Administration and Director of Computing; B.S.M.E., M.B.A. (University of Kentucky), Ph.D. (Krannert Graduate School of Industrial Administration, Purdue University).

Professor McCann served on the faculty of the Graduate School of Business and Public Administration at Cornell and has been a consultant with an economic modeling and research firm. His teaching interests are in the areas of marketing and econometrics. His current research involves studies of the impact of advertising on the sales of a product.

Wesley A. Magat, Ph.D., Associate Professor of Business Administration and Associate Professor of Public Policy Sciences; A.B. (Brown University), M.S., Ph.D. (Northwestern University).

Professor Magat teaches primarily in the fields of managerial economics and regulatory management. He is currently involved in research in the areas of environmental regulation, energy policy, rule-making procedures and reform, and advertising management. He recently served as Director of the Duke Center for the Study of Business Regulation.

Steven F. Maier, Ph.D., Associate Professor of Business Administration and Area Coordinator for Finance and Economics; B.S. (Cornell University), M.S., Ph.D. (Stanford University).

Professor Maier's teaching and research interests are in the areas of finance and banking. He has written papers on such topics as cash management, capital budgeting, security markets, and portfolio theory. He is currently a consultant to numerous banks in the area of cash management and bank operations. He has also been active in Duke executive development programs. Prior to joining the Duke faculty, he spent two years as a member of the professional staff at the Stanford Research Institute.

Richard C. Morey, Ph.D., Professor of Business Administration; B.S. (Syracuse University), M.A., Ph.D. (University of California, Berkeley).

Professor Morey came to Duke with extensive business experience, having founded a management consulting firm and served as a consultant to many major businesses and governmental agencies. He has also been an Adjunct Professor at Stanford and George Washington Universities. He teaches in the areas of operations research and strategy. As Director of the Center for Applied Business Research, he coordinates research efforts of the faculty related to government and foundation grants and contracts.

Thomas H. Naylor, Ph.D., *Professor of Economics and Professor of Business Administration*; B.S. (Millsaps College), B.S. (Columbia University), M.B.A. (Indiana University), Ph.D. (Tulane University).

Professor Naylor has been a member of the faculty of the Department of Economics at Duke University since 1964. He is the author of eighteen books and over 100 articles. Professor Naylor's consulting experience includes service to over 100 national and international organizations. He has lectured at universities throughout the world and is a member of several editorial boards. He is Director of the Center for Corporate Economics and Strategy at Duke.

John W. Payne, Ph.D., *Associate Professor of Business Administration and Director of the Ph.D. Program*; B.A., M.A., Ph.D. (University of California, Irvine).

Prior to coming to Duke, Professor Payne was on the faculty of the Graduate School of Business at the University of Chicago. His primary research activities deal with individual decision behavior. He has investigated decision making under risk, consumer choice behavior, and the design of computer-based support systems. He teaches courses in organizational behavior and consumer behavior.

David W. Peterson, Ph.D., *Professor of Business Administration*; B.A. (University of Wisconsin), M.S., Ph.D. (Stanford University).

Professor Peterson's teaching and research activities are in the fields of mathematical modeling, statistical analysis, and operations research. His recent publications have dealt with control theory, portfolio selection, long- and short-range planning, and regulated utilities. He is a consultant to corporate and governmental litigation teams on matters pertaining to the structuring of statistically based legal positions.

Richard J. Rendleman, Jr., Ph.D., *Associate Professor of Business Administration*; B.A. (Duke University), Ph.D. (University of North Carolina).

Professor Rendleman's teaching and research interests are in the area of corporate finance and investments. He has done research on option pricing, futures markets, capital markets efficiency, and the theory of the firm's capital structure. He has also worked as a trader on the floor of the Chicago Board Options Exchange.

Lucy J. Reuben, Ph.D., *Assistant Professor of Business Administration*; A.B. (Oberlin College), M.B.A., Ph.D. (University of Michigan).

Professor Reuben teaches in the area of finance. Her teaching and research interests are in financial intermediation, financial infrastructure and economic development, and financial management and strategic planning. She is coeditor of an anthology on black economic development (*Black Economic Development: Analysis and Implications* with W. L. Cash, Jr.). Professor Reuben has written articles in the areas of banking and corporate financial policy, and she has been employed as a financial analyst for Ford Motor Company World Headquarters.

William E. Ricks, Ph.D., CPA, *Assistant Professor of Business Administration*; B.S. (University of New Orleans), Ph.D. (University of California, Berkeley).

Professor Ricks joined the Duke Business School in September, 1980. He has had extensive teaching experience in both managerial and financial accounting in the M.B.A. program at the University of California at Berkeley. He holds a CPA certificate in Louisiana and has wide audit experience in oil and gas and banking. His major research interest is financial accounting, at both the individual and market level.

Roger W. Schmenner, Ph.D., *Associate Professor of Business Administration and Director of the M.B.A. Program*; A.B. (Princeton University), M.Phil., Ph.D. (Yale University).

Formerly a member of the faculty of the Harvard Business School, Professor Schmenner teaches in the area of operations management. His fields of research interest include industry location, multiplant manufacturing management, manufacturing strategy, and productivity. He is the author of an operations management textbook as well as a book on industry location decision making. His numerous articles have been published in both economic and managerial journals. He has consulted widely for industrial clients and some government organizations.

Herbert L. Schuette, Ph.D., *Assistant Professor of Business Administration*; B.B.A., M.B.A., Ph.D. (University of Michigan).

Professor Schuette teaches in the area of operations management. His research interests are in the management of technology and innovation, the microeconomics of industry growth and productivity, and computer simulation of firm behavior. Prior to joining the Duke faculty in 1981, Professor Schuette served on the faculty of the School of Management at Boston University. For two years he also was assistant to the Michigan Banking Commissioner, in charge of regulatory policy for electronic funds transfer systems.

Blair H. Sheppard, Ph.D., *Assistant Professor of Business Administration*; B.A., M.A. (University of Western Ontario), Ph.D. (University of Illinois, Urbana).

Professor Sheppard joins the Fuqua School of Business from the faculty of Management at McGill University. He teaches in organization behavior, personnel management, and industrial relations. His research interests include conflict resolution and group effectiveness. He has published in the *Journal of Personality and Social Psychology*. His consulting has been in the area of human resource management.

Richard Staelin, Ph.D., *T. Austin Finch Professor of Business Administration and Area Coordinator for Marketing*; B.S., M.E., M.B.A., Ph.D. (University of Michigan).

Professor Staelin has served as Professor and Associate Dean at the Graduate School of Industrial Administration, Carnegie-Mellon University, and has been a Visiting Professor at the Australian Graduate School of Management and at the University of Chicago. His professional activities include consulting work for both the public and private sectors, active participation in professional associations, service on editorial boards of academic journals, and publication of numerous articles.

Anne S. Tsui, Ph.D., *Assistant Professor of Business Administration*; B.A., M.A. (University of Minnesota); Ph.D. (University of California, Los Angeles).

Professor Tsui teaches in organization behavior and human resources management. Her research interests include managerial effectiveness and human resource management. She has published a number of scientific articles. Her professional experience includes employment and consulting with Control Data Corporation.

James H. Vander Weide, Ph.D., *Associate Dean for Faculty Affairs and Professor of Business Administration*; B.S. (Cornell University), Ph.D. (Northwestern University).

Professor Vander Weide's primary research and teaching interests are in the areas of corporate finance and managerial economics. He has written papers on topics such as cash management, capital budgeting, portfolio analysis, and the economic effects of government regulation. He has also served as a consultant to banks in the area of cash management. He has testified as an expert witness on the cost of capital before the Public Utility Commission of several states.

James W. Vaupel, Ph.D., *Associate Professor of Public Policy Studies and Associate Professor of Business Administration*; B.A., M.P.P., Ph.D. (Harvard University).

Dr. Vaupel teaches in the area of multinational enterprise. His recent research and publications are concerned with analytical decision making and its application to public policy formulation. He serves as a Research Associate of the Harvard Multinational Enterprise Project.

W. Kip Viscusi, Ph.D., *Professor of Business Administration and Professor of Public Policy Sciences*; A.B., M.P.P., A.M., Ph.D., (Harvard University).

Professor Viscusi teaches microeconomics and regulation. He formerly served as the Deputy Director of the White House Council on Wage and Price Stability in the Carter administration. His research, which has been published widely in a number of books and articles, has focused on regulatory issues, labor economics, and the economics of uncertainty. During the past year, he has completed a book on risk regulation, a monograph on the Consumer Product Safety Commission, and numerous articles. He has testified twice before the Joint Economic Committee and has given speeches to both business and government groups. Mr. Viscusi is a nationally recognized expert in the economics of health and safety standards. During the 1981-82 academic year he was designated the IBM Research Professor at the Fuqua School.

Executive-in-Residence

Richard B. Palmer, Ph.D., *Executive-in-Residence*; A.B. (Lehigh University), Ph.D. (The Johns Hopkins University).

Prior to joining the Fuqua School of Business, Dr. Palmer held the position of President of Texaco Canada, Inc. His thirty-two year career with Texaco has included worldwide responsibilities.

Adjunct Part-time Faculty

James E. Sheldon, L.L.M. *Adjunct Assistant Professor of Business Administration*; B.A. (Dartmouth College), J.D. (University of California), L.L.M. (Boston University Law School), L.L.M. (University of Stockholm).

Before joining the Fuqua School of Business, Mr. Sheldon practiced corporate, securities, and tax law for seven years in Boston and San Francisco. His teaching and research interests include business and tax planning. He is a member of the California, Massachusetts, and North Carolina bar associations.

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bulletin of
Duke University 1983-84

Undergraduate Instruction



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EDITOR
Judy A. Beck
SENIOR EDITORIAL ASSISTANTS
Elizabeth Matheson
Deborah A. Earnhardt

ACADEMIC LIAISONS
Virginia S. Bryan
Assistant Dean and Coordinator for Curriculum
Martina J. Bryant
Assistant Dean

PHOTOGRAPHS
Thad Sparks
Jimmy Wallace
The Chanticleer

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The information in the bulletin applies to the academic year 1983–84 and is accurate and current, to the best of our knowledge, as of January, 1983. The University reserves the right to change programs of study, academic requirements, lecturers, teaching staffs, the announced University calendar, and other matters described in the bulletin without prior notice, in accordance with established procedures.

Duke University does not discriminate on the basis of race, color, national and ethnic origin, sex, handicap, or age in the administration of educational policies, admission policies, financial aid, employment, or any other University program or activity. It admits qualified students to all the rights, privileges, programs, and activities generally accorded or made available to students. For further information, call Dolores L. Burke, Equal Opportunity Officer, (919) 684-6578.

Duke University has adopted procedures for investigation and remedy of complaints involving discrimination. See the chapter "Campus Life and Activities."

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University Calendar—1983–84

Summer 1983*

March	
21	Monday—Beginning of registration for resident students
May	
3	Tuesday—Beginning this day, summer drop/adds must be approved by the academic dean or Director of Graduate Studies
6	Friday—Last day for payment of Term I fees without \$25 late fee (before 4:30 P.M.)
12	Thursday—Term I classes begin
16	Monday—Drop/add for Term I ends at 4:00 P.M.
June	
22	Wednesday—Last day for payment of Term II fees without \$25 late fee (before 4:30 P.M.)
24	Friday—Term I final examinations begin
25	Saturday—Term I final examinations end
28	Tuesday—Term II classes begin
30	Thursday—Drop/add for Term II ends at 4:00 P.M.
August	
10	Wednesday—Term II final examinations begin
11	Thursday—Term II final examinations end

Fall 1983

August	
25	Thursday—Orientation begins; assemblies for all new undergraduate students
30	Tuesday, 9:00 A.M.—Fall semester classes begin
31	Wednesday, 4:00–6:00 P.M.—Drop/add begins, Intramural Building
September	
1–2	Thursday–Friday, 8:30 A.M.–12:30 P.M. and 2:00–4:00 P.M.—Drop/add continues, 103 Allen Building
5	Monday—Labor Day, classes in session
6–9	Tuesday–Friday, 8:30 A.M.–12:30 P.M. and 2:00–4:00 P.M.—Drop/add continues, 103 Allen Building
October	
14	Friday—Last day for reporting midsemester grades.
14	Friday, 6:00 P.M.—Fall break begins
19	Wednesday, 8:00 A.M.—Classes resume
31	Monday—Registration for spring semester, 1984 begins
November	
1–3	Tuesday–Thursday—Registration for spring semester, 1984 continues
22	Tuesday, 6:00 P.M.—Thanksgiving recess begins
28	Monday, 8:00 A.M.—Classes resume
December	
9	Friday, 6:00 P.M.—Fall semester classes end
10–12	Saturday–Monday—Reading period
11	Sunday—Founders' Day
13	Tuesday—Final examinations begin
19	Wednesday—Final examinations end

Spring 1984

January	
5	Thursday—Orientation begins
6	Friday—Registration and matriculation of new undergraduate students
9	Monday, 8:00 A.M.—Spring semester classes begin
10	Tuesday, 4:00–6:00 P.M.—Drop/add begins, Intramural Building

*The School of Forestry, the Fuqua School of Business, the Marine Laboratory, the Graduate Nursing Program, and Physical Therapy may have different starting dates during the summer; consult the appropriate bulletins and schedules.

11-13	Wednesday-Friday, 8:30 A.M.-12:30 P.M. and 2:00-4:00 P.M.—Drop/add continues, 103 Allen Building
16-20	Monday-Friday, 8:30 A.M.-12:30 P.M. and 2:00-4:00 P.M.—Drop/add continues, 103 Allen Building
February	
17	Friday—Last day for reporting midsemester grades
March	
2	Friday, 6:00 P.M.—Spring recess begins
12	Monday, 8:00 A.M.—Classes resume
19-21	Monday-Wednesday—Registration for fall semester, 1984 and beginning of registration for summer, 1984
April	
20	Friday, 6:00 P.M.—Spring semester classes end
21-23	Saturday-Monday—Reading period
24	Tuesday—Final examinations begin
30	Monday—Final examinations end
May	
5	Saturday—Commencement begins
6	Sunday—Graduation exercises. Conferring of degrees.



University Administration

GENERAL ADMINISTRATION

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Trinity College, Arts and Sciences

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Virginia S. Bryan, Ph.D., *Assistant Dean and Coordinator for Curriculum*
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Gerald L. Wilson, B.D., Ph.D., *Assistant Dean and Coordinator for the Deans' Staff*
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Jean F. O'Barr, Ph.D., *Director of Continuing Education*
Calvin Ward, Ph.D., *Director of the Summer Session*

School of Engineering

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Marion L. Shepard, Ph.D., *Associate Dean*

School of Nursing

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Dorothy J. Brundage, R.N., Ph.D., *Associate Dean*
Donna Hewitt, R.N., M.S.N., *Director of Continuing Education*
Carla Peterson, B.A., *Staff Assistant for Academic Programs*

Student Affairs

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Ella Fountain Pratt, A.B., *Director, Office of Cultural Affairs*
Jean D. Wilbur, *Director, International House*
Caroline L. Lattimore, Ph.D., *Dean for Minority Affairs*
Patricia O'Connor, Ed.D., *Director, Placement Services*
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Ella E. Shore, M.A., *Associate Dean for Residential Life and Dean of Student Affairs, School of Nursing*
Homai McDowell, D.B.A., *Acting Director, Office of Student Activities*
John Nowlin, M.D., *Director of Student Health*
Suzanne Wasiolek, M.H.A., *Dean for Student Life*
Jake Phelps, B.A., *Director, University Union*
John A. Friedrich, Ph.D., *Chairman and Professor, Health, Physical Education, and Recreation*

Jane Lloyd, M.A., *Director of Sports Clubs*
Leroy C. Skinner, M.A., *Director of Intramural Athletics*

Admissions and Financial Aid

Jean A. Scott, Ph.D., *Director of Undergraduate Admissions*
James A. Belvin, Jr., A.B., *Director of Undergraduate Financial Aid*



General Information



Duke University

In 1839 a group of citizens from Randolph and adjacent counties in North Carolina assembled in a log schoolhouse to organize support for a local academy founded a few months earlier by Brantley York. Prompted, they said, by "no small share of philanthropy and patriotism," they espoused their belief that "ignorance and error are the banes not only of religious but also civil society which rear up an almost impregnable wall between man and happiness." The Union Institute, which they then founded, was reorganized in 1851 as Normal College to train teachers, and again in 1859 as Trinity College, a liberal arts college, which later moved from the fields of Randolph County to the growing city of Durham, North Carolina. Trinity College was selected by James B. Duke as the major recipient of a fortune when, in 1924, he provided endowment funds for the university that would be organized around Trinity College and named for the Duke family.

The old Trinity College had, like almost all institutions in America at the time it was founded, been restricted to men. In 1896, Washington Duke gave an endowment with the condition that women be admitted "on equal footing with men." Thereafter, women were educated in Trinity College, and in 1930 the Woman's College was established as a separate college. Trinity College and the Woman's College continued as coordinate colleges for over forty years. To assure that women were indeed admitted "on equal footing with men," and to recognize that the education which men and women had received at Duke had long taken place in the same classrooms, the University merged these coordinate colleges in 1972 to form Trinity College of Arts and Sciences, the liberal arts undergraduate college of the University. The Bachelor of Arts and Bachelor of Science degrees may be earned in the college.

Instruction in engineering started at Normal College in 1851 and was continued at Trinity College as an option in the arts and sciences program. A Department of Engineering was established at Trinity in 1910. Following the establishment of Duke University in 1924, the Departments of Civil and Electrical Engineering were formed in 1927, and a Department of Mechanical Engineering was added four years later. The three engineering departments were joined to form the Division of Engineering as a separate administrative unit of the University. In 1939 this division was renamed the College of Engineering, which in 1966 became a professional school of engineering. The Division of Biomedical Engineering was added to the School of Engineering in 1967, and it was recognized as a department in 1971. In 1974 the name of the mechanical engineering department was changed to the Department of Mechanical Engineering and Materials Science; in 1982, the Department of Civil Engineering was renamed the Department of Civil and

Environmental Engineering. All four departments offer courses leading to Bachelor of Science in Engineering, Master of Science, and Doctor of Philosophy degrees.

The School of Nursing was established in 1931 in association with the School of Medicine and Duke Hospital. The three-year curriculum led to the Diploma in Nursing, but students were required to have a minimum of one and preferably two years of acceptable college credit prior to entry into the school. Individuals completing two years of college in addition to the three-year nursing program were awarded a Bachelor of Science in Nursing degree. From 1944 until 1957, the Bachelor of Science in Nursing Education degree was offered in cooperation with the Department of Education. A four-year program leading to the degree of Bachelor of Science in Nursing was approved by the University Board of Trustees in 1953, and in 1958 a graduate program was initiated. The School of Nursing offers courses leading to Bachelor of Science in Nursing and Master of Science in Nursing degrees.

As the University developed around the core of undergraduate colleges and schools, the Graduate School expanded in areas of instruction and research. The School of Law of Trinity College became the Duke University School of Law, and other professional schools were established. The Divinity School was organized in 1926, the School of Medicine in 1930, the School of Forestry in 1938, and the Graduate School of Business Administration in 1969. In 1974, the School of Forestry was renamed the School of Forestry and Environmental Studies; in 1980 the business school became the Fuqua School of Business.

Duke, a privately supported, church-related (Methodist) university, has over 9,000 students enrolled in degree programs. These students represent nearly every state and many foreign countries; Duke has more than 60,000 alumni in all fifty states and in many foreign countries. The University is a member of the North Carolina Association of Independent Colleges and Universities, the Southern Association of Colleges and Schools, and the Association of American Universities.

From academy to university, some of the basic principles have remained constant. The Duke University motto, *Eruditio et Religio*, reflects a fundamental faith in the union of knowledge and religion, the advancement of learning, the defense of scholarship, the love of freedom and truth, a spirit of tolerance, and a rendering of the greatest service to the individual, the state, the nation, and the church. Through changing generations of students, the objective has been to encourage individuals to achieve, to the extent of their capacities, an understanding and appreciation of the world in which they live, their relationship to it, their opportunities, and their responsibilities.

Resources of the University

The Faculty. The University faculty, approximately 1,400 along with 1,700 adjunct and clinical faculty, maintains a tradition of personal attention to students and devotion to research. Many members of the faculty are, and have been, cited for excellence in teaching and are elected to membership in the national societies which honor those best in scholarship and research. Leaders in their disciplines and their professional organizations, they are authors of significant books and articles. Members of the faculty also act as consultants to industry, government, and foundations. To honor its outstanding faculty, the University has established more than thirty James B. Duke Professorships and other named professorships.

The Library System. The libraries of the University consist of the William R. Perkins Library and its seven branches on campus: Biology-Forestry, Chemistry, Divinity, East Campus, Engineering, Music, Physics-Mathematics; the Undergraduate Library; the Pearce Memorial Library at the Duke Marine Laboratory in Beaufort; the Fuqua School of Business Library; the Law Library; and the Medical Center Library. In June 1982, these libraries contained approximately 3,218,000

volumes and ranked nineteenth in size among academic libraries in the United States. More than 10,000 periodicals, 11,000 serials, and 166 newspapers are received regularly. The collection includes about 7,450,000 manuscripts, 82,000 maps, 39,000 music scores, and 651,000 rolls or sheets of microtext.

The William R. Perkins Library. The William R. Perkins Library, the main library of the University, houses most of the books and journals in the humanities and social sciences, large files of United States federal and state documents, public documents of many European and Latin American countries, publications of European academies and learned societies, and special collections from South Asian, Far Eastern, and Slavic countries. The newspaper collection, with 46,644 reels of microfilm, has several long eighteenth-century files; strong holdings of nineteenth-century New England papers; and antebellum and Civil War papers from North Carolina, South Carolina, and Virginia; as well as many European and Latin American papers. The manuscript collection of approximately seven and a quarter million items is particularly strong in all phases of the history, politics, and social and economic life of the South Atlantic region; it also includes significant papers in English and American literature. The rare books collection contains many scarce and valuable materials covering a broad range of fields, and the Latin and Greek manuscripts constitute one of the outstanding collections of its kind in the United States. The collection of Confederate imprints is the largest in the country.

The Undergraduate Library houses the required reading materials placed on reserve for most graduate and undergraduate courses as well as the library's audiovisual collection of films, audio and disk recordings, and video cassettes. The branch libraries serve the academic disciplines whose names they bear. The East Campus Library is primarily for undergraduate use, but it also contains the principal collections for graduate and undergraduate study in art.

Tours of the Perkins Library are given frequently during Orientation Week and upon request throughout the year. Information about other campus libraries may be obtained from the staff in each of the libraries. Handbooks about library services and facilities are also available in each of the libraries.

To protect the collections of Perkins Library for the benefit of all members of the University community, an electronic security system is in operation at the main exit. Desk attendants are stationed at the library's principal exit and are authorized to examine all books and other library materials that people leaving the library may be carrying in hands, briefcases, or bags to determine if they are properly charged. Anyone who refuses to permit books to be examined may be denied further use of the library.

The library has microfilming, photoduplication, and copying services. The rules with regard to copyright and a schedule of fees for reproduction services are available in the library at the point of service.

The Medical Center Library. The Medical Center Library, located in the Seeley G. Mudd Communications Center and Library Building, provides the services and collections necessary to further educational, research, and clinical activities in the medical field. Services are available to the students, faculty, and staff of the Schools of Medicine and Nursing; of the Division of Allied Health; of Duke Hospital; and of the graduate departments in the basic medical sciences. Other students and faculty needing access to biomedical literature may apply for privileges upon application to the Chief of Readers' Services.

Over 180,000 volumes are available, including the Trent Collection in the History of Medicine. Approximately 2,450 journal subscriptions are received currently, in addition to extensive back files of older materials. The library has several types of audiovisual materials and equipment. With the exception of certain items shelved on reserve, these materials have been integrated into the general book and journal collections and are listed in the card or journal catalogues. The Frank Engel Memorial Collection consists of a small group of books on

nonmedical subjects for general reading, together with several newspapers and popular magazines. Traditional reference services are supplemented by on-line bibliographic systems and computer-produced specialized indexes.

The uniform borrowing privileges apply to all registered users. Details of loan and other services may be found in the guide which is published each year and is available at the library.

The School of Law Library. The School of Law Library, with over 300,000 volumes, serves both the University and the local legal community. The collection contains nearly all reported decisions of the federal, state, and territorial courts of the United States, British Commonwealth, and representative foreign jurisdictions. It also includes the constitutions, codes, statutes, and subsidiary legislative publications of all these jurisdictions, as well as many digests, indexes, bibliographies, and related research tools. A large section of the library collection is devoted to treatises on all phases of law and legal sciences, as well as to materials in the fields of history, economics, government, and other social and behavioral sciences relevant to legal research. There are files of selected federal documents, and since 1970 a complete set of congressional materials has been maintained. The Christie Jurisprudence Collection is located in the main reading room. Other collections include legal history, administrative materials, intellectual property, criminal procedure, school law, and briefs of the U.S. Supreme Court, the Fourth Circuit Court of Appeals, the North Carolina Supreme Court, and the North Carolina Court of Appeals. Undergraduate and graduate students whose course of study requires access to legal literature should obtain permission from the law librarian to use the collections.

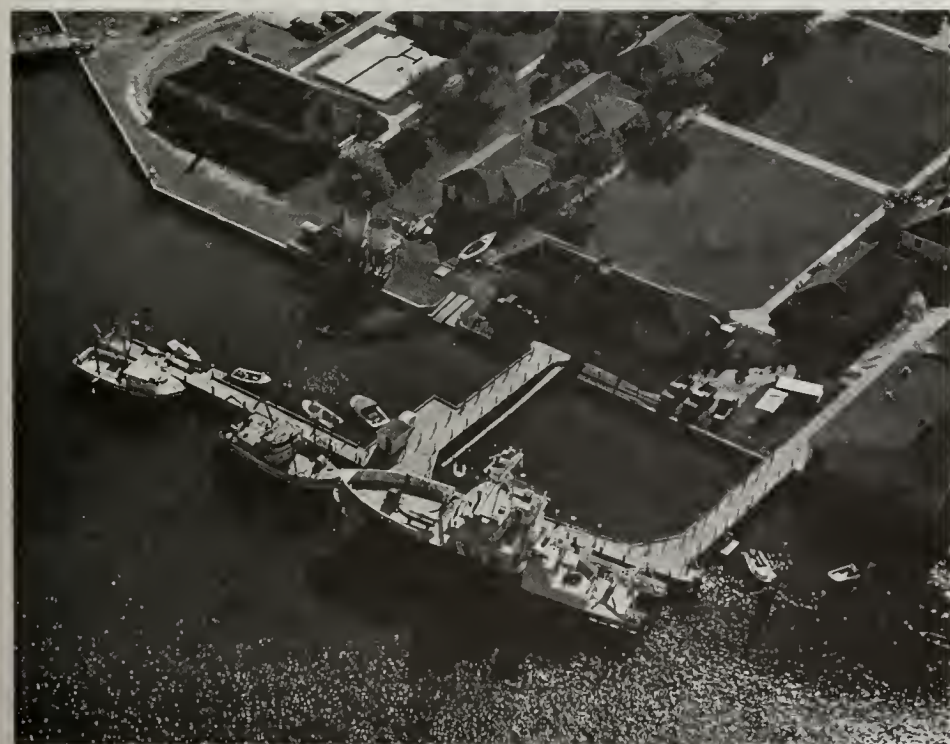
Record Library. The Department of Music has a record library separate from the university libraries with facilities for listening to records and tapes. All materials may be used in the listening room and any member of the community may borrow from the Arts Council Collection of more than 2,100 records for a nominal fee.

University Archives. The Duke University Archives, the official archival agency of the University, collects, preserves, and administers the records of the University having continuing administrative or historical value. The institutional archives, which also include published material, photographs, papers of student groups and faculty, and selected memorabilia, are available for research under controlled conditions in 341 Perkins Library.

Computation Center. Extensive computer resources are essential for a contemporary university. Computing is provided at Duke by the Duke University Computation Center. The center is presently equipped with an IBM System 370 Model 158 computer with 6144 thousand bytes of memory, four 3330-II disk drives, fourteen 3350 disk drives, six tape drives, two card readers, a card punch, four printers, and a digital plotter. This computer is connected by a high-speed microwave link to the Triangle Universities Computation Center (TUCC) located in the Research Triangle Park.

TUCC is a regional computer network formed and operated jointly by Duke University, North Carolina State University at Raleigh, and the University of North Carolina at Chapel Hill. The computer equipment at TUCC consists of one IBM 3081 with sixteen million bytes of memory, one IBM Model 165 with eight million bytes of memory, multiple 3330- and 3350-type disk facilities, thirteen tape drives, drums, card readers, and printers. Also available are two small Hewlett-Packard 2000 access computers which provide BASIC interactive computing.

The IBM 370 Model 158 is used mostly for administrative computing and as a high-speed link to TUCC. Also connected to TUCC are four medium-speed terminals (card reader and printer) located in the Engineering Building, the Biological Sciences Building, the Sociology-Psychology Building, and the West



Duke Building on East Campus, as well as several low-speed interactive terminal clusters located at various points on campus. Several clusters of IBM personal computers are available at various locations around campus.

All users of the Computation Center facilities are urged to obtain funds to pay for computer services. Users unable to obtain grant funding may ask for financial support from their departments when applying for services. More specific information regarding Duke computing facilities may be obtained from the Director of the Computation Center.

Science Laboratories. In addition to the teaching and research laboratories in the departments of natural and social sciences and in the Schools of Engineering and Nursing, there are other facilities in which some advanced undergraduates work on individual projects. These include the Duke University Marine Laboratory in Beaufort, North Carolina; the phytotron of the Southeastern Plant Environment Laboratories, located on the Duke campus; the Duke Forest, adjacent to the campus; the Duke University Primate Center in Duke Forest; and the Triangle Universities Nuclear Laboratory, also on the campus.

School of Nursing Instructional Facilities. Facilities for instruction in the School of Nursing include resources in the undergraduate college, as well as in professional and graduate schools of Duke University and in the clinical facilities of Duke Hospital, Durham and Asheville Veterans Administration Medical Centers, Lenox Baker Children's Hospital, Durham City-County Health Department, Lincoln Community Health Center, and other health agencies in the vicinity.

Duke as a Residential University

Duke has a long tradition as a residential university. Eighty-eight percent of its undergraduates are accommodated in fifty-eight residence hall living groups which are located on the East, West, and North Campuses and in apartments on the Central Campus. Freshmen reside in all-freshman houses clustered in residence halls on the East, West, and North Campuses. Only upperclass students may reside in the Central Campus Apartments.

The University was established to provide a formal educational opportunity for students. Yet, as a residential university, Duke has always taken the position that education encompasses social and personal development as well as intellectual growth. In order to facilitate this holistic approach, Duke seeks to provide a supportive environment substantially anchored in its residential program.

Academic, cultural, and cocurricular programming is planned and presented throughout the year in the residence halls through the cooperative work of the Office for Residential Life, Trinity College of Arts and Sciences, the School of Engineering, and resident students. There are several faculty members in residence in both freshman and upperclass houses. Faculty offices and seminar rooms are also located in several of the freshman houses. The goals of these various programs are to enhance the quality of intellectual and social life for the residents on campus, to facilitate student-faculty interaction outside of the formal classroom, and to develop a greater sense of community within the individual residence halls as well as within the greater University.

The Undergraduate College and Schools

In Trinity College of Arts and Sciences and the Schools of Engineering and Nursing, instruction is offered by University faculty who engage in research and in graduate and undergraduate teaching. Duke offers its undergraduates the opportunity to study with many internationally recognized authorities in their disciplines

and with faculty members who are jointly committed to undergraduate instruction and to the advancement of knowledge. The University recognizes that students learn not only through formal lectures, but also through the interplay of ideas among faculty members and students; thus, it offers undergraduates opportunities to test their ideas against those of their professors and to observe at close range those who have committed their lives to academic careers.

The University, if it is doing its job properly, is educating citizens of the United States and of the world, not only individuals aspiring to personal fulfillment. At Duke, the men and women who earn degrees are likely to become leaders in industry, government, and the professions. They will have influence on and will be influenced by the social fabric of which they are a part. The kind of people they become will matter not only to them and their families, but also to their communities, to the United States, and to the countries of the rest of the world as well.

Amidst changing external conditions, the University cannot be sure of what knowledge and what talents will best prepare the citizens of the future for the general welfare. The chances are that the currently most lucrative professions will not remain so as new combinations of knowledge and skill become more useful to the polity which supports us all.

Trinity College of Arts and Sciences. At Duke a liberal arts education provides the variety and therefore the flexibility which can best prepare students for rich personal lives and for their role as citizens in an uncertain future. At its most successful, a liberal arts education results in an understanding of the nature of knowledge as it is reinterpreted in each generation and of how new knowledge is produced, analyzed, and synthesized in mathematics and the natural sciences, in the arts and the humanities, and in the social and behavioral sciences. In all the arts and sciences, a liberal education teaches one to analyze data and how to discern patterns within the material. A liberal education conveys sufficient information discovered by each of the major types of disciplines to serve as a base from which a person can go on to acquire new learning as changing circumstances demand. Analytical and conceptual ability along with information also enable one, in the work and reasoning of others, to discriminate the true from the false, the elegant from the shoddy, and the well-reasoned from the flashy.

A liberal arts education provides perspectives: time perspective—the realization that the present moment is bounded by and to its relation to past and future history; space perspective—the realization that a presently inhabited spot is bounded by and to its relation to other places on the globe, and indeed, the universe; cultural perspective—the realization that our present way of life is only one of many viable possibilities and is bounded by and to the different cultures of other people in the world; and artistic perspective—the realization that contemporary forms and styles in the arts are bounded by and to their past, present, and future contexts.

The capstone on our ideal education is the mastery of one subject in a major field. It serves as a prototype of what advanced knowledge in one field of inquiry is like and of the sheer joy of intellectual exploration.

School of Engineering. The undergraduate engineering program at Duke University is designed both for students who intend to become professional engineers and for those who desire a modern, general education based on the problems and the promises of a technological society. The environment in which students are educated is as important in shaping their future as their classroom experiences. In the Duke School of Engineering this environment has two major components: one is modern technology derived from the research and design activities of faculty and students in the school; the other is the liberal arts

environment of the total University, with its humanitarian, social, and scientific emphases.

Engineering is not a homogeneous discipline; it requires many special talents. Some faculty members in the School of Engineering are designers; they are problem-oriented, concerned with teaching students how to solve problems—how to synthesize relevant information and ideas and apply them in a creative, feasible design. Other engineering faculty members function more typically as scientists; they are method-oriented, using the techniques of their discipline in their teaching and research to investigate various natural and artificial phenomena.

The School of Nursing. The faculty of the School of Nursing is committed to promoting human health by providing foundations for knowledgeable nursing services through its educational programs. In support of this commitment the school: (1) prepares its students to function as practitioners of professional nursing in roles appropriate to the level of their educational program, and (2) provides its students with an educational background which will serve as a basis for advanced study in nursing as well as continued professional and personal growth.

The faculty views nursing as a body of knowledge, as a profession, as an academic discipline, and as process. As a body of knowledge, nursing is concerned with the life process in human systems as they interrelate in a complex hierarchy ranging from the individual to societal levels. As a profession, nursing is based on a body of knowledge and those values, traditions, and ethics which guide nursing judgments and actions. As a discipline, nursing consists of a community of scholars who are committed to the improvement of health services. As process, nursing is an integrated system of many processes in which both the client/patient and the nurse participate. Substantive content from nursing's body of knowledge is viewed as interdependent with process in the practice of professional nursing.

Professional nursing practice involves interacting with human systems both in health and illness, in a diverse, multicultural, and rapidly changing society. Health is a purposeful, integrative, and adaptive method of functioning within the environment of which the human system(s) is a part. Illness, disease, and disability are viewed as states of system dysfunction. Nursing practice is the application of knowledge in the promotion of health which includes restoration and maintenance of health, prevention of dysfunction, and adaptation to altered health. Professional nursing practice also includes collaborating with other health professionals and clients in a shared responsibility for health care.

The faculty views persons as open systems capable of change and self-direction. The faculty believes that a general systems perspective allows for an ecological view of people as interrelating, interdependent, and interacting complex organisms constantly influencing and being influenced by their environment. Persons are viewed as a part of nature, the suprasystem in which they must live in harmony in order to function in an integrated, adaptive manner. A general systems perspective allows for the consideration of individuals at their subsystem levels, as holistic human beings and as social creatures who form networks with each other in hierarchically arranged human systems of increasing complexity. Thus, human systems from the level of the individual to the level of society can be conceptualized as client and become the target system for nursing intervention. A client may be considered a patient when system dysfunction occurs. The definition of client, thus broadened, provides the rationale for nursing intervention with healthy individuals as well as those who are sick; with families, groups, complex organizations, communities, and societies. This same general systems framework also provides a basis for understanding the concept of social support which the faculty believes is of paramount importance in the health of human systems and the individual's ability to cope with change and stressful life events. As with clients, students and faculty members are considered persons with the same characteristics and need for social support as other human systems.

The faculty of the School of Nursing believes that the primary aim of nursing education is to provide an environment in which the student can acquire the knowledge, skills, and values necessary for the practice of nursing. Of special importance is the development of self-discipline, intellectual curiosity, and the ability to think critically. In addition, the faculty respects the rights of the students to have individualized professional learning goals. It believes that students can best achieve their goals in an environment which fosters a combination of wisdom, imagination, and freedom to innovate rather than one which is limited to the acquisition of isolated facts and skills. The faculty believes that learning is manifested by a change in behavior that persists over time and can be called forth for future problem solving.

The faculty recognizes that rigid standardization in the preparation of nursing practitioners is not congruent with the diverse needs of a multicultural society. The faculty believes that a curriculum design which is structurally integrated fosters cognitive integration in the student; thus, it facilitates learning. The faculty views process both as content and as integrating mechanisms for curriculum building and practice. Therefore the faculty supports conceptually based, process-oriented, diversified educational offerings to meet the health care needs of society and the individualized learning goals of the students. The faculty believes that students who seek admission to the School of Nursing come with the serious intent of practicing professional nursing. The curricula offered are viewed as assisting students to realize their intent and as stimulating their desire for continued professional growth.

Degree Programs



Degrees and Academic Credit

Duke University offers in Trinity College of Arts and Sciences the degrees of Bachelor of Arts and Bachelor of Science; in the School of Engineering, the degree of Bachelor of Science in Engineering; and in the School of Nursing, the degree of Bachelor of Science in Nursing. Within the curriculum of each college or school, students have the major responsibility for designing and maintaining a course program appropriate to their background and goals. They are assisted by faculty advisers, departmental Directors of Undergraduate Studies, and academic deans.

Credit toward a degree is earned in units called semester courses (s.c.), commonly abbreviated as courses. These courses ordinarily consist of three to four hours of instruction each week of the fall or spring semester or the equivalent total number of hours in a summer term. Double courses, half courses, and quarter courses are also recognized.

Trinity College of Arts and Sciences

A variety of approaches to a liberal arts education is provided by Program I and Program II. Either program leads to the Bachelor of Arts or Bachelor of Science degree and requires thirty-two semester courses. Students study in the following divisions of learning:

*Humanities.** Art, Asian and African languages (Arabic, Chinese, Hindi-Urdu, Japanese, Persian, and Swahili), classical studies (including Greek and Latin), comparative literature, dance, drama, English, Germanic languages and literature, Judaic studies, music, philosophy, religion, Romance languages (including French, Italian, Portuguese, and Spanish), and Slavic languages and literatures (including Russian and Polish).

Natural Sciences and Mathematics. Biology, botany, chemistry, computer science, genetics, geology, marine sciences, mathematics, physics, statistics, and zoology.

*Social Sciences.** Anthropology, economics, education, history, physical education, political science, psychology, public policy studies, and sociology.

*Afro-American studies, Canadian studies, comparative area studies, film, linguistics, medieval and Renaissance studies, and women's studies include courses in both humanities and the social sciences. Nondivisional courses in the military sciences are also offered. In addition, advanced students in Trinity College may select a limited number of courses from among certain courses offered by the professional schools at Duke University.

PROGRAM I

Program I provides for the experience and achievement that constitute a liberal education. The ability to organize ideas and to communicate them with clarity and precision is refined by completing the writing requirement and the requirements for discussion in small groups. Knowledge of a foreign language contributes to an understanding of the nature of language itself and to perspectives on other cultures. The distribution requirements ensure learning about the concepts and analytical methods in the humanities and the arts, the social sciences, and the natural sciences. The fields of knowledge provide that through a course in the history of civilization students will acquire knowledge of the complexity of forces that influences cultures and societies, through a course in literature they will learn of the conscious products of the human intellect, and through study in an empirical natural science they will gain an understanding of nature and the methods whereby humanity has reached that understanding.

Distribution of Courses

Students complete the requirements for a major (see pages 22, 23) and in addition take approved courses in each of the following:

- In one division* outside that of the major: four semester courses, including two at the advanced level (see page 21 for excluded courses);
- In the other division* outside that of the major: two semester courses (see page 21 for excluded courses);

and in addition:

- In the history of civilization field of knowledge: one course, if not included in the major (see page 22 for approved courses);
- In the literature field of knowledge: one course, if not included in the major (see page 22 for approved courses);
- In the empirical natural science field of knowledge: one course, if not included in the major (see page 23 for approved courses).

English Composition

One course in English composition (page 23).

Foreign Language

Eligibility to enter the third semester of college language instruction by completing two semester courses in one language at Duke, or the equivalent (page 23).

Small Group Learning Experiences

Courses taught for small groups (page 24), as follows:

- Before reaching junior status:
 - at least *one* full semester course designated as a *seminar*, *tutorial*, or *independent study*, or
 - a combination of two *preceptorials* or *discussion sections*.
- During the junior and senior years:
 - at least *two* semester-course credits for *seminars*, *tutorials*, *independent study*, or a *thesis*.

Course Credits

Thirty-two semester-course credits (no more than two with a grade of *D*), including (page 24):

- *At least sixteen at Duke* (ordinarily including the senior year).

*For the subjects in each division of learning, see page 19.

- *At least* nineteen outside the major department.
- *At least* twelve at the advanced level.
- *No more* than: one credit of physical education activity and dance activity (i.e., two half-credit activity courses), two credits for house courses (i.e., four half-credit house courses), six from a professional school (e.g., engineering, nursing), and four in military science.

Quality of Work

All passing grades are expected, but see pages 25 and 26 for minimum continuation requirements.

Distribution of Courses: Divisions of Learning and Fields of Knowledge.

Students achieve breadth and balance of intellectual experience by taking courses in each of the three divisions of learning (the humanities, natural sciences, and social sciences, see page 19) and by taking in addition an approved course in each of three selected fields of knowledge (history of civilization, literature, and empirical natural sciences). Courses that satisfy these requirements consist of the essential subject matter and substance of the discipline. Courses that satisfy the requirements for small group learning experiences may be used also to satisfy these requirements. Courses taken on the pass/fail basis, however, do not satisfy these requirements unless offered only on the pass/fail basis.

Divisions of Learning. Students must complete a certain number of *nonskills* courses in each of the three divisions (see table below):

First Division. The division of the major is called the first division. Each student must complete requirements for a major in a single discipline or in an interdisciplinary program. Thereby the requirement for the first division will automatically be satisfied. See the section on major in the chapter "Academic Procedures and Information," and also the section on the major following each department's course descriptions.

Second Division. Each student must pass at least four semester courses in a second division of the student's choice. At least two of the four courses must be at the 100 or 200 level.

Third Division. Each student must pass at least two semester courses in the remaining division.

COURSES THAT DO NOT SATISFY THE DIVISIONAL DISTRIBUTION REQUIREMENTS—

Interdepartmental Courses, Military Science Courses, Courses in the Professional Schools, and also the Following Skills Courses:

Arabic	1, 2, 11, 12, 13, 14, 63, 64
Art	53, 54, 56, 116
Chinese	1, 2, 63, 64
Dance	134 and activity courses
Drama	101, 121, 123, 125, 127
Education	105, 106, 107, 108, 151, 152, 161, 162
English	1, 2, 10, 12, 28S, 61S, 62S, 71, 72, 73S, 74, 101S
French	1-2, 63, 74, 76, 181
German	1-2, 14, 63, 100, 105, 181, 182
Greek	1-2, 181
Hindi-Urdu	1, 2, 63, 64
Italian	1-2, 63, 74
Japanese	1, 2, 63, 64
Latin	1-2, 181
Mathematics	9-10, 19
Music	151, 152, and applied music (except for tutorials)
Persian	1, 2, 63, 64
Physical Education	100, 102, 134, and activity courses
Polish	11, 12
Political Science	138, 236
Portuguese	181

Cont. on 22

Psychology	117
Religion	115–116, 139
Russian	1, 2, 63, 64
Sociology	132, 133
Spanish	1–2, 63, 74, 76, 181
Swahili	1, 2, 63, 64
Yiddish	181
Zoology	116, 196D, 197, 198

Fields of Knowledge. Students must pass one course from each of the three lists of courses that satisfy the requirements in history of civilization, literature, and empirical natural science.

COURSES THAT SATISFY THE FIELDS OF KNOWLEDGE REQUIREMENTS

I. History of Civilization*

Afro-American Studies	56, 145, 146
Anthropology	101, 102, 104, 115, 120, 121, 122, 123, 124, 127, 130, 133, 134, 147, 148, 168
Art	69, 70, 125, 131, 132, 133, 134, 140, 141, 142, 143, 147, 149, 151, 152, 161, 172, 175, 179
Classical Studies	53, 54, 125, 126, 133, 134, 135, 137, 144
Economics	132, 150, 184
Education	101, 102
French	138, 139
German	129, 130
History	21, 21S, 22, 22S, 25, 26, 49S, 53, 54, 91, 91S, 92, 92S, 95, 96, 101G, 102G, 104, 105, 106, 107, 108, 111, 112, 113, 114, 115, 116, 119, 120, 121, 122, 123, 124S, 125, 126, 128, 129, 130, 131, 132, 133, 134, 135, 136, 139, 140, 141, 142, 143, 144, 145, 146, 149, 150S, 151, 156, 157, 158, 160, 161, 162, 173, 174, 175D, 176D, 179, 180, 181, 182, 183S, 184, 193, 194
Interdisciplinary Courses	101, 102, 162, 163, 184
Music	119, 138
Philosophy	93, 94, 108, 117, 119, 120, 132, 156
Political Science	115, 131, 136, 151, 161, 184
Religion	51, 56, 57, 70, 124, 133, 160, 161, 162, 163
Sociology	138, 170, 184

II. Literature

Afro-American Studies	173, 174
Arabic	171
Chinese	135, 136, 141
Classical Studies	63, 64
Comparative Literature	100, 120, 124, 129, 130, 131, 132, 135, 139, 145, 150, 159, 160, 169, 170, 180, 220S, 280
Drama	64, 141, 142, 143, 144, 145, 146, 148, 152, 154S, 162S, 163, 165
English	20, 21S, 22S, 23S, 24S, 25S, 26S, 51, 52, 55, 56, 91, 93, 121, 122, 123, 124, 125, 126, 127, 128, 131, 133, 135, 136, 137, 138, 139S, 141, 143, 144, 145, 151, 152, 153, 154, 155, 161, 162, 163, 164, 165, 167, 168, 169S, 171, 174, 175, 179S, 182, 183, 184, 186, 187, 221, 225, 235, 241, 245, 251, 263, 267, 275
French	101, 102, 103S, 104S, 127, 141S, 142S, 145S, 146S, 147, 148, 151, 152, 153, 155, 156, 158, 162S, 163, 166S, 167S, 170, 240, 248, 251, 252, 255, 256, 257, 258, 261, 263, 264, 265, 266, 290S
German	101, 103S, 104S, 109S, 115S, 125, 126S, 127S, 131, 132, 172, 173, 174, 201S, 202S, 205, 206, 207S, 209S, 211S, 214S, 215S, 217S, 230S
Greek	103S, 104S, 203, 205, 206, 209, 210, 221, 222, 231
Italian	183, 184, 283, 284, 285
Japanese	155, 156, 161
Latin	63, 64, 103S, 104S, 105S, 112S, 117, 151S, 153S, 201, 203, 204, 210, 221
Philosophy	108
Polish	174

*These courses explore the interrelationships of major social, political, economic, cultural, and intellectual developments.

Political Science	174
Portuguese	182
Religion	50, 52, 55, 104, 106, 108, 128, 147, 172, 188, 233, 287
Slavic Languages and Literatures	124, 161, 162, 175S, 176, 177, 180, 183
Spanish	101, 102, 103S, 104S, 105, 106S, 108S, 121, 141S, 142S, 146, 151, 153, 157, 162, 163, 165S, 166, 171, 245, 246, 253, 254, 258S, 275, 276, 277
Yiddish	171

III. Empirical Natural Science

Any course offered by the natural science departments (botany, chemistry, geology, physics, zoology) which carries one semester-course credit or more satisfies this requirement.

Major. In addition to achieving a breadth of intellectual experience students are expected to acquire some mastery of a particular discipline or interdisciplinary area. Students therefore complete a departmental major, an interdisciplinary major, or an interdepartmental concentration. At least half the courses for a student's major field must be taken at Duke, although departments may make exceptions to this rule in special circumstances. A student who completes requirements for two majors may have both majors recorded on the official record. See the sections on majors within each degree and on declaration of major or division in the chapter "Academic Procedures and Information."

Departmental Major. A major consists of at least five courses beyond the introductory or basic prerequisite level in one department, but may not include more than eight semester courses for the Bachelor of Arts degree or more than ten semester courses for the Bachelor of Science degree. The student may elect a more intensive major program, but no more than thirteen semester courses in one department count toward the graduation requirement of thirty-two semester courses. The courses required for a major are specified by the department and they may include courses in other departments which may be necessary or helpful for effective performance in the major. These requirements appear in the section following each department's course descriptions.

Interdisciplinary Major. Students may satisfy the requirement by completing work prescribed for a major in an approved program. These programs include Afro-American studies, biology, Canadian studies, comparative area studies, comparative literature, drama, and medieval and Renaissance studies. The requirements for an interdisciplinary major appear under each program in the chapter "Courses of Instruction."

Interdepartmental Concentration. A student may pursue an interdepartmental major program designed by the student and advisers as an alternate means of satisfying the major requirement. An interdepartmental concentration consists of at least three courses beyond the introductory level in each of two or more departments. For procedures see the section on declaration of major or division in the chapter "Academic Procedures and Information."

English Composition. Students are required to demonstrate ability to write effective English prose by completing a course in English composition, ordinarily English 1. Students adjudged to have superior writing ability may be admitted to a more advanced course in expository writing, English 2; interested students must submit a writing sample to the Department of English during the summer before matriculation.

Foreign Language. This requirement to assure that students have some knowledge of a foreign culture may be met in any of the following ways: (1) by presenting three units of high school credit (in grades 9–12) in one foreign language; (2) by achieving a score on a College Board Achievement Test or College Board Placement Test sufficient to permit enrollment at the intermediate level of foreign language instruction (see the chapter "Academic Procedures and Informa-

tion"); (3) by presenting a College Board Advanced Placement Score of 4 or 5, or score of 3 validated by satisfactory completion of an advanced course; or (4) by passing one of the following courses:

Arabic 2; Chinese 2; French 2, 181; German 2, 181; Greek 2, 181S; Hindi-Urdu 2; Italian 2, 181; Japanese 2; Latin 2, 181S; Persian 2; Polish 12; Portuguese 181; Religion 116 (Hebrew); Russian 2; Spanish 2, 181; Swahili 2.

Students whose native language is not English may meet the requirement by successful completion of a course in English composition. Transfer students may satisfy the requirement in any of the above ways or by having fulfilled the foreign language graduation requirement at another college or university prior to entering Duke. Students who have knowledge of a foreign language other than those for which College Board tests are available may request to be examined in that language by special arrangement after matriculation.

Small Group Learning Experiences. By supplementing the classroom and lecture methods of instruction, small group learning experience courses assure students opportunities to engage in discussion, develop skills, refine judgment, and defend ideas when challenged. A *seminar* (ordinarily indicated by the suffix S) is an independent course of twelve to fifteen (exceptionally to twenty) students who, together with an instructor, engage in disciplined discussion. The number of meeting hours per term is the same as for regular courses of equivalent credit. Instructors are encouraged to present to each student at the end of the term a written evaluation of the student's work. A *discussion section (D)* is a group of approximately ten students and an instructor, in which discussion is the paramount characteristic; it is an integral part of a larger regular course, and every member of the class is enrolled. A *preceptorial (P)* is a group of usually no more than twelve students and an instructor in which discussion is the primary component; it is an additional and optional unit attached to a regular course involving one or more extra meetings per week. No additional course credit is given for a preceptorial. A *tutorial (T)* is a group of one to five students and an instructor meeting for discussion which is independent of any other course. For *independent study* students pursue their own interests in reading, research, or writing, but meet with an instructor for guidance and discussion. See the section on independent study in the chapter "Academic Procedures and Information." Instructors in all courses that satisfy the requirements for small group learning experiences, including independent study, must meet with the students at least once every two weeks. The requirements for small group learning experiences are listed under Program I, above.

Course Requirements. Thirty-two semester courses are required for graduation, including a maximum of two courses passed with a grade of *D*. At least sixteen courses, including the work of the senior year, must be passed at Duke. Twelve courses must be at the advanced (100–200) level. The thirty-two course credits may include (1) no more than thirteen courses in one department; (2) no more than one semester-course credit in physical education activity and dance activity (i.e., two half-credit activity courses); (3) no more than two credits for house courses; (4) no more than six credits for courses taken in professional schools; and (5) no more than four semester-course credits in military science. Military science courses are normally taken in the junior and senior years. Additional courses, although not counted toward graduation, do appear on a student's permanent academic record. Military science courses, like professional school courses, do not satisfy distribution or fields of knowledge requirements.

Residence. A residence period of eight semesters is the typical amount of time a student may take to earn either the Bachelor of Arts or the Bachelor of Science degree. This period may be extended for one or two semesters by a student's academic dean for legitimate reasons, if it seems probable that an

extension will enable the student to complete all remaining requirements for graduation. A student will not be permitted residence of more than ten semesters in order to be graduated.

For the minimum residence period, at least sixteen courses must be satisfactorily completed at Duke, including the courses needed to meet the senior year residence requirement. (For the purposes of the residence requirement, advanced placement credits are *not* considered as courses taken at Duke.) If only sixteen courses are taken at Duke, they must include the student's last eight courses. A student with more than sixteen courses at Duke may take two of the last eight courses at another approved institution. A student who has completed twenty-four courses at Duke may take four of the last eight courses at another approved institution. Courses taken elsewhere must be approved in advance by the appropriate Director of Undergraduate Studies and the student's academic dean.

Former students of Trinity College or the Woman's College who have been out of college for at least six years may, with certain provisos, take up to eight semester courses in another institution of approved standing in final fulfillment of graduation requirements. Further information can be obtained from the Associate Dean of Trinity College of Arts and Sciences.

Quality of Work (Continuation Requirements). A student must achieve a satisfactory record of academic performance each term and make satisfactory progress toward graduation each year to continue enrollment in college. A student who fails to meet the minimum requirements described below must leave college for at least two semesters; a summer session may be counted as a semester. The student may apply to the Associate Dean of Trinity College of Arts and Sciences for readmission. If, after readmission, the student again fails to meet continuation requirements, the student will be ineligible, except in extraordinary instances, for readmission to Trinity College.

Satisfactory Performance Each Term. A student who does not receive a passing grade in all courses must meet the following minimum requirements or be withdrawn from the college.

In the Fall or Spring Semester: (1) in the first semester of enrollment at Duke, a student with a normal course load (of at least four semester courses, as defined in the chapter "Academic Procedures and Information") may not fail more than two courses; (2) after the first semester at Duke, a student with a normal course load may not fail more than one course; (3) a first-semester student, whether a freshman or a transfer student, who for a special reason has received permission from an academic dean to enroll in fewer than four courses may not fail more than one course; (4) a student taking an authorized underload after the first semester at Duke must earn all passing grades. (Students may not carry an underload without the permission of their academic dean.) For the purposes of continuation, incomplete work in any course is considered a failure to achieve satisfactory performance in that course. Therefore, where continuation is in question, incomplete work in any course must be completed with a passing grade in time for final grades to be submitted to the Office of the Registrar no later than the weekday preceding the first day of classes of the spring semester, or prior to the first day of classes of the second term of the summer session, as appropriate. In the case of incomplete work in the spring semester, this requirement applies whether or not the student plans to attend one or more terms of the summer session. The student, however, may not enroll in a summer term at Duke unless the requirement of satisfactory performance each semester has been satisfied.

In the Summer Session: to maintain enrollment at Duke a student may not fail more than one course in a summer term or a summer session; moreover, a student may not have a failing grade in addition to an incomplete grade in the preceding spring. For purposes of continuation, incomplete work is considered failure to achieve a satisfactory performance in that course. Therefore, when eligibility to

continue from the summer session to the fall is in question, incomplete courses must be satisfactorily completed in time for a passing grade to be submitted to the Office of the Registrar no later than the weekday preceding the first day of fall classes. (No student may enter the fall semester with any combination of *F* or *I* grades from the preceding spring and summer.)

Any student excluded from the college under the provisions of these regulations may on request have the case reviewed by the Associate Dean of Trinity College of Arts and Sciences.

Satisfactory Progress toward Graduation. Each year prior to the beginning of fall term classes, a student must have made satisfactory progress toward fulfillment of curricular requirements to be eligible to continue in the college; i.e., a certain number of courses must have been passed at *Duke* according to the following schedule:

To be eligible to continue to the:

3rd semester
4th semester
5th semester
6th semester
7th semester
8th semester

A student must have passed at Duke:

6 semester courses
10 semester courses
14 semester courses
18 semester courses
22 semester courses
26 semester courses

Courses in the arts and sciences taken in the summer terms at *Duke* may be used to meet this requirement; advanced placement may *not* be used to satisfy it. No more than two courses completed with *D* grades may be counted toward fulfilling this annual continuation requirement.

PROGRAM II

Nature and Purpose. Program II is an alternate approach leading to either the Bachelor of Arts or the Bachelor of Science degree which offers the student who has an unusual interest or talent in a single field, or an unusual combination of interests or talents in several fields, an opportunity to plan and carry out a special curriculum adapted to these interests and needs. The student, with the assistance of a departmental Program II adviser, designs an individual plan of study for the whole or the remainder of the student's college career. Together, they assess the student's background, needs, and ambitions and evaluate the resources at the University or outside it as means of satisfying those ambitions. They consider what academic courses would be useful and also take into account that a term of independent study or work/study on or off campus, or a period of study abroad, might be appropriate. Each curriculum is tailored to the special interests and talents of the student for whom it is designed. Among the many topics for Program II have been American studies, architecture and urban planning, bioethics, linguistics, musical composition and piano performance, creative writing, and environmental policy.

Admission. Students interested in Program II should confer with the Directors of Undergraduate Studies in the departments closest to their interests, with the dean responsible for Program II, and with the Chairman of the Committee on Program II, whose name may be obtained from 110 Allen Building. If the student seems eligible for Program II, the Director or other departmental adviser, or an interdepartmental committee, will counsel the student concerning the design of the curriculum. When an interdepartmental committee is needed, one department will bear administrative responsibility. The curriculum must be approved by the department and also by the Committee on Program II of the Undergraduate Faculty Council of Arts and Sciences. Upon endorsement by that committee, the program becomes an obligation assumed by the student although it may be

modified later with the approval of the department and the Committee on Program II. A description of the plan is sent to the academic dean responsible for Program II, and each semester the student's progress in achieving the plan is reviewed.

Until formally accepted into Program II, a student should register for courses to satisfy the curricular requirements of Program I. Upon acceptance into Program II, a student is relieved of most, but not all, requirements expected of Program I students. Should Program II be dropped for any reason, the student assumes all requirements of Program I. Ordinarily, students will be accepted into Program II only after their first semester at Duke; they are ineligible to apply for admission to Program II after their junior year. Further information about Program II may be obtained from the office of the academic dean responsible for Program II, in 110 Allen Building.

General Requirements. Apart from the requirements arising from the approved plan of work, a Program II student must satisfy certain general requirements: thirty-two semester-course credits for graduation; the regulations on military science courses; and residence, although the requirements relating to the last eight courses may be adjusted to suit the student's approved plan of work. Graduation with distinction is available for qualified students in Program II. See the section on honors in the chapter "Academic Procedures and Information."

UNDERGRADUATE-PROFESSIONAL COMBINATION PROGRAMS

A student who has completed all degree requirements in Trinity College of Arts and Sciences except for eight elective courses may transfer, with the approval of the appropriate Dean in Trinity College and the admissions officer of the professional school, to the Duke School of Forestry and Environmental Studies, the School of Law, the Fuqua School of Business, or to the Medical School. The student will be eligible for the baccalaureate degree upon successful completion of the work in the first year in the professional school. The undergraduate record notes the student's enrollment in the combination program and the name of the professional school, the date of graduation from Trinity College, and the degree awarded, but it does not include courses taken in the professional school. The academic deans will provide additional information.

PREPARATION FOR GRADUATE AND PROFESSIONAL SCHOOLS

Students planning to enter a graduate or professional school should consult their academic deans and faculty advisers at the earliest opportunity. Since many graduate and professional schools require special tests for students seeking admission, information regarding requirements should also be obtained from the catalogues of the appropriate schools. The Office of Counseling and Psychological Services will provide applications for the testing programs.

Graduate Schools of Arts and Sciences. As soon as practicable, students should ascertain the requirements of the graduate schools which they are considering and should consult an adviser in the field of the proposed advanced study. Most graduate schools have requirements in foreign languages, and candidates for the degree of Doctor of Philosophy may be required to pass reading examinations, usually in German and French.

Graduate Schools of Engineering. Students interested in graduate work in engineering should consult the Dean of the School of Engineering or the Director of Graduate Studies in one of the engineering departments. Most engineering graduate schools require that a candidate have the equivalent of a Bachelor of Science in Engineering degree; however, students in the natural and social sciences may obtain conditional admission if they have a sufficient background in mathematics.

Graduate Schools of Nursing. Students interested in entering either graduate or postbaccalaureate programs in nursing should consult their faculty advisers, the Associate Dean, or the Dean of the School of Nursing.

Graduate Schools of Business Administration. Students seeking advice concerning preparation for graduate school in business administration may consult the Department of Management Sciences or the adviser for graduate business programs in Trinity College. Many graduate programs in business administration are designed specifically for students with little or no undergraduate work in business. In general, a student should seek a good liberal arts background, which will help develop communication skills, analytical skills, and an understanding of human nature. Students have often chosen such courses as Computer Science 51, Economics 1 and 2 (or 51 and 52), Management Sciences 53, or Mathematics 31 as those which develop analytical skills. For further information concerning undergraduate preparation see the *Duke Prebusiness Handbook* or the *Graduate Study in Management* book published by the Graduate Management Admission Council; these publications and other resource materials are available in the office of the prebusiness adviser in the college.

Medical and Dental Schools. Students planning to enter schools of medicine, dentistry, or veterinary medicine can prepare for admission by completing any of the regular departmental majors in Program I or by completing Program II, and by taking those courses required by the professional schools of their choice. Virtually all medical schools and most schools of dentistry and veterinary medicine require the same basic group of college premedical courses—a year of biology, a year each of inorganic and organic chemistry, and a year of general physics. In addition, many schools require a year of English and courses in the humanities or social sciences. About a third of all medical schools now require a year of calculus and some suggest courses in statistics. For a complete listing of these and other requirements set by each medical school, see *Medical School Admission Requirements*, published annually by the Association of American Medical Colleges. Current copies, as well as information concerning careers in dentistry, veterinary medicine, osteopathic medicine, and many allied health professions, are available in the Office of the Adviser for the Health Professions. Students should discuss their programs of study with their major advisers, academic deans, and with the adviser for the health professions.

Law Schools. Students who plan to prepare for law school should seek diversity in their undergraduate course programs and specialize in one or more areas. They may choose virtually any field for their major work. Although no specific courses are required, prelaw students have often chosen from the following courses: Management Sciences 53; Economics 51, 52; English 91; History 21, 22, 91, 92, 105, 106; Philosophy 41, 48; Political Science 91; Public Policy Studies 55; Sociology 10D.

For a fuller discussion of undergraduate preparation for the study of law, students should refer to the *Duke Prelaw Handbook* or the *Prelaw Handbook* published by the Association of American Law Schools and the Law School Admission Council, or consult with the prelaw adviser in the college.

Theological Schools and Religious Work. Students contemplating theological study should correspond at the earliest opportunity with the appropriate schools and with the authorities of their churches to learn how to prepare for the specific programs they expect to enter. Probably, they will find that they should consider the following subjects: English language and literature; history, including non-Western cultures as well as European and American; philosophy, particularly its history and its methods; natural sciences, both the physical and the life sciences; psychology, sociology, and anthropology; the fine arts and music; biblical and

modern languages; religion, both in the Judaeo-Christian and in the Near and Far Eastern traditions. Some seminaries require Greek or Hebrew for admission. It is the understanding gained in these fields rather than the total number of credits or semester hours earned which is significant. More detailed information about theological education, not limited to Duke, may be obtained from the Director of Admissions of the Divinity School.

The School of Engineering

Duke University offers in the School of Engineering programs of study which lead to the degree of Bachelor of Science in Engineering with majors in the Departments of Biomedical Engineering, Civil and Environmental Engineering, Electrical Engineering, and Mechanical Engineering and Materials Science. Special programs of study in interdisciplinary fields leading to the Bachelor of Science in Engineering degree may be arranged with approval of the engineering faculty. The four curricula in the engineering departments are accredited by the Accreditation Board for Engineering and Technology.

For graduation with a Bachelor of Science in Engineering degree, a student must complete successfully a minimum of thirty-two semester courses. These thirty-two semester courses must include the following:

General Requirements*

English	1 s.c.	This requirement is met by completing English 1.
Mathematics	4 s.c.	This requirement is met by completing Mathematics 31,† 32,† and 103; plus 104 or 111 or 135.
Natural Science.....	4 s.c.	This requirement is met by completing Chemistry 11, Physics 51 and 52, and an elective course in one of the natural science departments which presents fundamental knowledge about nature and its phenomena, preferably including quantitative expression.‡
Social Sciences and Humanities	4 s.c.	This requirement is met by completion of four courses from at least two departments, one in the humanities and one in social sciences. This program of courses should reflect a rationale or fulfill an objective appropriate to the engineering profession. Courses selected must be those which present essential subject matter and substance of the discipline; for example, no introductory skill courses may be used to satisfy this requirement. Likewise, courses devoted primarily to subjects such as accounting, industrial management, finance, personnel administration, introductory language, and ROTC normally do not fulfill this objective regardless of their general value in the total engineering curriculum. House courses may not be used to satisfy this requirement.
Engineering and Applied Sciences.....	4 s.c.	This requirement is met by completion of at least one course from each of four of the following six areas: electrical science, information and computer science, mechanics (solid and fluid), materials science, systems analysis, and thermal science and transfer processes. See departmental requirements, which follow, for any specific courses to be included.
Digital Computation		Students are expected to have acquired digital-computer programming capability before their sophomore year. The programming capability may be satisfied by prior experience or by passing Engineering 51 or Computer Science 51.

*House courses cannot be used to meet Bachelor of Science in Engineering degree requirements.

†Mathematics 33 and 34 are acceptable in lieu of Mathematics 31 and 32.

‡Courses in mathematics, statistics, and computer science will not meet this requirement.

Departmental Requirements

Departmental Specifications	15 s.c.	The department administering the major field of study will specify this requirement. In general, it will consist of both required courses and electives to be planned in consultation with the departmental adviser. In addition to the 4 s.c. in engineering and applied sciences listed under general requirements, departmental requirements include the equivalent of 4 s.c. in engineering science and 4 s.c. in engineering design. See the individual departmental requirements, which follow.
§Total Minimum Requirement	32 s.c.	

§A maximum of two semester courses of junior or senior level air science, military science, or naval science course work may be counted in satisfying the minimum requirements of thirty-two semester courses for a baccalaureate degree in engineering. These courses must be included in the fifteen semester courses listed under departmental requirements. All other courses completed in air, military, or naval science are taken in addition to the minimum program.

Biomedical Engineering Departmental Requirements

All general requirements and departmental requirements are incorporated in the following sequence, only one of several possible sequences. The student is encouraged to choose electives and select a sequence which develops broad intellectual interests.

Freshman Year

First Semester	Courses	Second Semester	Courses
Chemistry 11	1	Chemistry 12	1
English 1	1	Physics 51	1
Mathematics 31	1	Mathematics 32	1
Engineering 51	<u>1</u>	Social Science or Humanities Elective	<u>1</u>
	4		4

Sophomore Year

First Semester	Courses	Second Semester	Courses
Physics 52	1	Biomedical Engineering 163	1
Electrical Engineering 61	1	Biomedical Engineering 110	1
Mathematics 103	1	Mathematics 111	1
Elective	<u>1</u>	Social Science or Humanities Elective	<u>1</u>
	4		4

Junior Year

First Semester	Courses	Second Semester	Courses
Biomedical Engineering 164	1	Biomedical Engineering Elective	1
Biomedical Engineering 101	1	Life Science Elective	1
Engineering 135 or Mechanical Engineering 126 or Biomedical Engineering 202	1	Elective	1
Mathematics 117	<u>1</u>	Electrical Engineering 132 or Biomedical Engineering 132	<u>1</u>
	4		4

Senior Year

First Semester	Courses	Second Semester	Courses
Biomedical Engineering Elective	1	Biomedical Engineering Elective	1

Life Science Elective.....	1	Elective	1
Social Science or Humanities Elective	1	Social Science or Humanities Elective	1
Elective	<u>1</u>	Elective	<u>1</u>
	4		4

Premedical students should schedule Chemistry 1S1, 1S2, and two life science electives before the end of their junior year by deferring some required courses to the senior year. Biomedical engineering electives include all courses with biomedical engineering numbers other than required courses. Engineering 83 is also counted as a biomedical engineering elective.

Civil and Environmental Engineering Departmental Requirements

The general requirements and the departmental requirements are all incorporated in the following typical program.

Freshman Year

First Semester	Courses	Second Semester	Courses
Chemistry 11.....	1	Engineering 24.....	1
English 1	1	Physics 51	1
Mathematics 31.....	1	Mathematics 32.....	1
Engineering 51.....	<u>1</u>	* Approved Elective.....	<u>1</u>
	4		4

Sophomore Year

First Semester	Courses	Second Semester	Courses
Engineering 75.....	1	Engineering 11.....	$\frac{1}{2}$
Mathematics 103.....	1	Civil Engineering 16.....	$\frac{1}{2}$
Physics 52	1	Engineering 123.....	1
* Approved Elective.....	<u>1</u>	Mathematics 111.....	1
	4	* Approved Elective.....	<u>1</u>
			4

Junior Year

First Semester	Courses	Second Semester	Courses
Civil Engineering 122.....	1	Civil Engineering 123.....	1
Civil Engineering 131.....	1	Civil Engineering 133.....	1
Engineering 83.....	1	Civil Engineering 116.....	1
* Approved Elective.....	<u>1</u>	* Approved Elective.....	<u>1</u>
	4		4

Senior Year

First Semester	Courses	Second Semester	Courses
Civil Engineering 139.....	1	Civil Engineering Elective	1
Civil Engineering 134.....	1	* Approved Elective.....	1
* Approved Elective.....	1	* Approved Elective.....	1
* Approved Elective.....	<u>1</u>	* Approved Elective.....	<u>1</u>
	4		4

*Part of a program of ten general electives planned with the adviser's approval to suit the interests and abilities of the individual student. In addition to satisfying the social science-humanities and natural science requirements of the School of Engineering, a minimum of one engineering and applied science course must be elected from the following: Engineering 101, Engineering 1S1, or Electrical Engineering 61. (If credit has not been received for Engineering 51 then two of the three courses must be elected.) The program should also include a minimum of two *emphasis electives* which, together with the civil engineering elective, serve to reinforce the student's major area of study.

Electrical Engineering Departmental Requirements

The general requirements and the departmental requirements are all incorporated in the following program. This program is presented as a guide to assist students in planning their four-year program and should not be viewed as an inflexible sequencing of courses.

Freshman Year

First Semester	Courses	Second Semester	Courses
Mathematics 31	1	Mathematics 32.....	1
Chemistry 11	1	Physics 51	1
English 1	1	Social Science-Humanities (Elective)	1
*Engineering 51 or Computer Science 51	<u>1</u>	Approved Elective	<u>1</u>
	4		4

Sophomore Year

First Semester	Courses	Second Semester	Courses
Electrical Engineering 61	1	Electrical Engineering 62	1
Mathematics 103	1	Electrical Engineering 112.....	1
Physics 52	1	Mathematics 104, 111, or 135	1
Social Science-Humanities (Elective)	<u>1</u>	Social Science-Humanities (Elective)	<u>1</u>
	4		4

Junior Year

First Semester	Courses	Second Semester	Courses
†Electrical Engineering	1	†Electrical Engineering	1
†Electrical Engineering	1	†Electrical Engineering	1
‡Mathematics	1	§Natural Science	1
Social Science-Humanities (Elective)	<u>1</u>	Approved Elective	<u>1</u>
	4		4

Senior Year

First Semester	Courses	Second Semester	Courses
Approved Electrical Engineering Elective	1	Approved Electrical Engineering Elective	1
Approved Elective	1	Approved Elective	1
Approved Elective	1	Approved Elective	1
Approved Elective	<u>1</u>	Approved Elective	<u>1</u>
	4		4

*May be replaced by an approved elective if the student has previously acquired competence in computer programming.

†These four courses must be chosen from the following: Electrical Engineering 103, 143, 157, 161, 186, 199

‡Any 100-level math course except 123, 128, or 183

§One of the following Chemistry 12, Physics 105, 161, 176S, 181, and 185; Biology 14; or any other course approved by the electrical engineering undergraduate curriculum committee.

Note: The selection of approved electives should take into account a departmental requirement that a student must have accumulated by graduation time the equivalent of *four* (4) engineering design and *eight* (8) engineering science courses.

In order to satisfy the School of Engineering distributional requirement of four courses in engineering and applied science, the student may use Electrical Engineering 61 as an electrical science course and Electrical Engineering 112 as a systems analysis course. The remaining two courses may be selected from any two of the following areas: information and computer science (Engineering 51 or Computer Science 51 may be used to satisfy this requirement), mechanics, materials science, and thermal sciences.

An up-to-date list of acceptable *engineering design* and *engineering science* courses may be secured through the departmental office.

Mechanical Engineering and Materials Science Departmental Requirements

The general requirements and departmental requirements are all incorporated in the following typical program.

Freshman Year

First Semester	Courses	Second Semester	Courses
Mathematics 31	1	Mathematics 32.....	1

Chemistry 11	1	Physics 51	1
English 1	1	*Engineering 83	1
Engineering 51	<u>1</u>	†Approved Elective	<u>1</u>
	4		4

Sophomore Year

First Semester	Courses	Second Semester	Courses
Mathematics 103	1	Mathematics 111	1
Physics 52	1	Engineering 123	1
*Engineering 75	1	*Engineering 130† or 101§	1
†Approved Elective	<u>1</u>	†Approved Elective	<u>1</u>
	4		4

Junior Year

First Semester	Courses	Second Semester	Courses
*Engineering 101† or 130§	1	Mechanical Engineering 115† or 140§	1
Mechanical Engineering 140† or 115§	1	Mechanical Engineering 141† or 150§	1
†Approved Elective ‡	1	Mechanical Engineering 126†	1
or Mechanical Engineering 126§	1	or Approved Elective†	1
†Approved Elective	<u>1</u>	†Approved Elective	<u>1</u>
	4		4

Senior Year

First Semester	Courses	Second Semester	Courses
Mechanical Engineering 150† or 141§	1	# Advanced Technical Elective	1
# Advanced Technical Elective	1	# Advanced Technical Elective	1
# Advanced Technical Elective	1	†Approved Elective	1
†Approved Elective	<u>1</u>	†Approved Elective	<u>1</u>
	4		4

*The four courses in engineering science must be Engineering 75, 83, 101, and 130.

†Part of a program of approved elective courses planned with the student's faculty adviser to suit individual interests and abilities

The program must include a minimum of five social science-humanities courses and one natural science course.

‡Designates sequence A, part of a program of core courses in mechanical engineering which should be taken in this designated sequence or the one which follows.

§Designates sequence B, part of a program of core courses in mechanical engineering which should be taken in this designated sequence or the one preceding.

Part of a program of four advanced courses chosen to emphasize a professional objective, two of which must be in mechanical engineering A current list of courses satisfying this requirement is maintained by faculty advisers

The major requirements are included in the minimum total of thirty-two courses listed under general requirements and departmental requirements. Specific courses which must be included are Engineering 75, 83, 101, 123, and 130; Mechanical Engineering 115, 126, 140, 141, and 150.

Declaration of Major. A student is urged to declare a major by the time of registration for the first semester of the sophomore year, but is required to do so by the time of registration for the first semester of the junior year. Declaration of major is accomplished by completing a form available in the Office of the Dean of Engineering.

Double Major. If an engineering student completes simultaneously the requirements for a departmental major in arts and sciences and the requirements for a Bachelor of Science in Engineering degree, or satisfies simultaneously the requirements for two engineering majors, the official record will indicate this fact. However, the Director of Undergraduate Studies for the second major must certify that the departmental major requirements have been met. The student must initiate the procedure, either through the Dean of the School of Engineering or through the Director of Undergraduate Studies in the second department. The completion of the requirements for the major in this department must be

confirmed no later than the time of registration for the final semester. Courses which are common to both majors shall be counted toward satisfying the requirements of both majors.

Interdisciplinary Programs in Engineering. This major parallels the majors in biomedical, civil and environmental, electrical engineering, and mechanical engineering and materials science. It provides for special programs of study in interdisciplinary fields, such as energy conversion, engineering chemistry, engineering mechanics, materials science, ocean engineering, pollution control, systems and controls, and urban engineering, leading to the Bachelor of Science in Engineering degree, which may be arranged with approval of the engineering faculty. Any student, in consultation with the adviser or another faculty member, may propose a unique combination of courses designed to meet particular career objectives. The proposal should be submitted to the Engineering Faculty Council, through the Dean of the School of Engineering, for approval; it may be submitted as early as the second semester of the freshman year and must be submitted before the beginning of the senior year. The proposal should include the student's reasons for pursuing the suggested program of study, and it must show how the proposed courses satisfy the following requirements:

1. The proposed program of study meets the general requirements for the Bachelor of Science in Engineering degree but cannot be accommodated by the approved departmental requirements in biomedical, civil and environmental, or electrical engineering, or mechanical engineering and materials science.
2. A program of at least eight engineering courses is included to provide depth in the chosen interdisciplinary area of study.
3. A program of at least four courses, in addition to the seventeen courses listed under general requirements, is included to provide breadth in technical areas (engineering, natural science, and mathematics).
4. The remaining courses, which are treated as electives, require the approval of the student's adviser.

Each student enrolled in an approved interdisciplinary program will be assigned to the appropriate engineering department for administrative purposes.

Program in Engineering and Public Policy. Engineering students may pursue a program of study leading to the degree of Bachelor of Science in Engineering, with a major in one of the five engineering fields of study and a second major in public policy studies. The program is sponsored by the School of Engineering and the Institute of Policy Sciences and Public Affairs. To qualify for a degree with this second major, a student must satisfy the series of courses, which may be characterized as electives within the engineering curriculum, that meet the requirements for the major in public policy studies. These requirements are a modified parallel of the requirements of the major in public policy studies as described in the "Courses of Instruction" chapter, this bulletin.

Bachelor of Science in Engineering/Master of Science Program. This program provides students with an opportunity to plan a coordinated five-year program of studies in the School of Engineering leading to both the Bachelor of Science in Engineering and Master of Science degrees. Application for admission to this integrated program may be made during the junior or senior year. Provisional admission to the Graduate School may be granted when the student enrolls for the semester during which the Bachelor of Science in Engineering degree requirements will be completed. Graduate level courses during this period which are in excess of Bachelor of Science in Engineering requirements may be credited toward fulfillment of the Master of Science degree requirements.

Students must complete thirty semester hours of credit specifically approved for the Master of Science degree under the prevailing graduate rules; up to six of

these hours may be thesis research if the program includes a written master's thesis. No more than nine semester hours of graduate work can be completed concurrently with completing the Bachelor of Science in Engineering degree requirements.

Residence Requirements. At least sixteen semester courses must be completed satisfactorily at Duke. This must include the work of the final two semesters, with the following exceptions: the student who has completed more than four full semesters of work at Duke may take the last two courses elsewhere; others may take the last course elsewhere. The courses taken elsewhere must be approved in advance by the student's major adviser and academic dean.

Pass/Fail Grading Option. With the consent of the instructor and the faculty adviser, an engineering student may choose to be graded on a pass/fail basis in up to four unrestricted electives or social sciences-humanities electives within the thirty-two-course program. A student may take no more than one course on a pass/fail basis each semester.

Repetition of Courses. An engineering student who has earned a grade of *D-*, *D*, or *D+* in a required mathematics course or a required engineering course may, with permission of his or her adviser, Director of Undergraduate Studies, and academic dean, repeat the course. Both grades will remain on the student's record. Only one credit may be counted toward fulfilling graduation requirements.

Academic Honors. To determine eligibility for academic honors, only grades earned at Duke are used in calculating the average.

Dean's List. In recognition of superior academic achievement, students who carry a normal academic load and earn a *B* average or higher in the two semesters of an academic year are placed on the Dean's List if the following additional requirements are met:

1. Grades other than *P* have been earned in six semester courses.
2. No incomplete or failing grade has been received during the academic year.

Class Honors. Students who carry a normal academic load and earn a *B+* average on all work for the year are eligible for class honors provided the following conditions are also met:

1. Grades other than *P* have been earned in six semester courses.
2. No incomplete or failing grade has been received during the academic year.

Continuation Requirements. A student must achieve a satisfactory record of academic performance each semester and make satisfactory progress toward graduation to remain enrolled in the University.

A student must pass at least three courses in each semester, except for the first semester of the freshman year, in which at least two courses must be passed. A student who fails to meet this continuation requirement must leave the University for at least two semesters. A complete summer session may be counted as a semester. Following application for readmission, return must be approved by the Dean and the Director of Undergraduate Studies in the student's major department. If the student thereafter fails to pass three courses in a semester, permanent dismissal from the University usually results. A student who enrolls in more than four courses in a given semester and fails two or more of them will not be permitted to enroll for more than four courses in the following semester without approval of the Dean. In addition, a student may be dismissed temporarily or permanently for failing to make satisfactory progress toward graduation, including satisfactory progress toward fulfillment of curricular requirements within ten semesters.

The term *satisfactory progress* shall be defined also by the following schedule:

1. To begin enrollment in the second year, a student must have passed 6 s.c. and earned *P*, *C-*, or better in 3 s.c.

2. To begin enrollment in the third year, a student must have passed 13 s.c. and earned *P*, *C*-, or better in 9 s.c.
3. To begin enrollment in the fourth year, a student must have passed 20 s.c. and earned *P*, *C*-, or better in 16 s.c.
4. To begin enrollment in the fifth year, a student must have passed 27 s.c. and earned *P*, *C*-, or better in 23 s.c.

Grade Requirement for Graduation. Of the thirty-two semester courses which fulfill the specified categories in the Bachelor of Science in Engineering degree requirements, twenty-eight or their equivalent in number must be passed with grades of *P*, *C*-, or better.

The School of Nursing*

The faculty and administration of the School of Nursing have accepted the following as the school's purposes:

1. To encourage students to pursue individual interests, broaden their perspectives of nursing, and influence changes toward holistic health services.
2. To promote conceptually oriented nursing practice.
3. To provide an environment for inquiry and the facilitation of opportunities for the application and generation of new knowledge for nursing practices.
4. To promote collegial collaboration among nurses and with others in relevant professions in the delivery of interdisciplinary health services.
5. To provide leadership for the profession of nursing at the local, state, regional, and national levels.
6. To provide programs for the pursuit of lifelong learning and continued excellence in nursing practice.

The Duke University School of Nursing curriculum leading to a Bachelor of Science in Nursing degree provides a foundation for developing the knowledge, skills, and values characteristic of the liberally educated person; for professional nursing practice; and for continuing professional growth and advanced education. The first two years contribute to the development of a liberally educated individual and form the base on which to develop a professional nurse. The junior and senior years focus on the professional nursing major and build on the knowledge, skills, and attitudes students gain in the prerequisite general education courses. Each component of the four-year curriculum is seen to provide a unique contribution to the objectives of the program. The purpose of the undergraduate program is to prepare a professional nurse who upon completion of the program:

1. Develops a conceptual frame of reference which incorporates a wide variety of relevant theories and concepts as a basis for professional nursing practice with selected human systems.
2. Develops beginning competence in clinical nursing practice with individuals, families, and selected groups.
3. Collaborates in the delivery of intradisciplinary and interdisciplinary health care within an organized health care system.
4. Utilizes selected change process skills for intervention with individuals, families, and selected groups.
5. Demonstrates the values, goals, and behaviors characteristic of professional nursing.

The students are seen as assertive, active participants in making decisions about their own learning needs and interests. They are enabled and encouraged to

*At the time of printing, the programs, courses, and credits of the School of Nursing are undergoing significant change. In 1983-84 and thereafter, they will either not be available or not available exactly as described in this bulletin. A freshman class will not be admitted in 1983-84. For information, inquire at the Office of the Registrar.

plan a program of study compatible with their backgrounds and interests which will contribute to their personal and professional goals. With the guidance of academic advisers, students may elect courses and experiences which best serve their interests for concentration in an area of study or for exploration in several fields. Teaching methods take into consideration the spontaneity, potential, and individuality of the student.

The distinctive features of the undergraduate curriculum are:

1. The lower division with distributional requirements consists of courses in the humanities, the natural sciences, and social sciences as well as electives including independent study in nursing and other disciplines. Through courses comprising the upper division professional nursing component, opportunities are provided for the student to progress in uniting knowledge and decision making with nursing action toward individuals, groups, and families whether they be hospitalized or in the community.
2. The curriculum is oriented theoretically in the belief that students who learn to select facts and theories from relevant disciplines for application to nursing practice will be able to adapt readily to changing modalities of health care.
3. Nursing electives and independent study in the upper division allow the opportunity for students to pursue individual interests, to broaden their scope of nursing, and to gain a degree of proficiency in the type of initial professional practice in which they wish to engage after graduation.
4. A study abroad program in the lower division and/or in a required upper level nursing course is available. Opportunities for short-term study at sites remote from the Medical Center are available to all students, and opportunities for extensive study in remote sites are available to a moderate number of students.

In addition to the undergraduate program, the school also seeks to fulfill the University's purposes of education, research, and services through the graduate program and continuing education.

Program of Study. For graduation with a Bachelor of Science in Nursing degree, a minimum of thirty-two semester courses must be completed successfully. The courses are divided into lower and upper divisions, with thirteen upper division courses in nursing required for the nursing major.

Lower Division

Natural Science.....2 s.c.	May select from chemistry, botany, zoology, physics, geology, computer science, marine biology, or biology.
Human Ecology2 s.c.	Nursing 97, 98
Introduction to the Profession of Nursing1 s.c.	Nursing 96
Statistics.....1 s.c.	Any introductory course offered by the School of Nursing or by the Departments of Mathematics, Psychology, Economics, Management Sciences, or Sociology.
Social Sciences3 s.c.	One course must be in psychology and the other two may be: a. one in psychology and one in sociology or anthropology b. two in sociology c. two in anthropology d. one in sociology and one in anthropology.
Humanities1 s.c.	No skill courses satisfy this requirement. (See information under Program I, this chapter.)
English Composition.....1 s.c.	English 1 (See the section on proficiency in English composition, this chapter.)

Students must satisfy the small group learning experience requirements during the first two years, as outlined in that section, this chapter.

In addition to the health statement required of all matriculants, verification that nursing students have had selected immunizations is necessary prior to their clinical experience.

Upper Division

Theoretic and Scientific Bases for Nursing Practice I	2 s.c.
Development of Nursing Skills and Attitudes I	4 s.c.
Theoretic and Scientific Bases for Nursing Practice II	2 s.c.
Development of Nursing Skills and Attitudes II	4 s.c.
Required Independent Study	1 s.c.
Electives (including optional independent study)	3 s.c.

A student desiring to complete requirements for a second major in a department of arts and sciences may do so and have both majors entered on the official record. See the section on declaration of major or division in the chapter "Academic Procedures and Information."

Continuation Requirements. A student must achieve a satisfactory record of academic performance each semester and make satisfactory progress toward graduation. A student who fails to meet the requirements outlined below must leave the University for at least two semesters. A summer may be counted as a semester. Following a student's application for readmission, return must be approved by the Dean of the School of Nursing. A student who is readmitted after having withdrawn voluntarily or involuntarily for academic reasons must make no grade lower than C—during the first semester in order to continue in school.

Satisfactory Performance Each Semester. To remain in the School of Nursing, a student must not fail three or more courses in the first semester as a freshman or as a transfer student or fail two or more courses in any subsequent semester. An exception to this policy applies when a student fails a required nursing course worth two semester courses.

Satisfactory Progress toward Graduation. A student must pass in the approved nursing curriculum at Duke the following number of semester courses (or the equivalent in half courses or double courses) to continue from one academic year to a subsequent year. (Summer terms at Duke or other approved institutions may be used to meet this requirement. See the chapter "Academic Procedures and Information.")

<i>To begin enrollment in the</i>	<i>a student must have passed</i>
second year	6 s.c.
third year	14 s.c.
fourth year	22 s.c.
fifth year	28 s.c.

Students are reminded that incomplete work in any course is counted as a failure to achieve satisfactory performance in that course. Such courses must be completed in time for final grades to be submitted to the Registrar no later than the day preceding the opening of the spring semester or June 15 in the summer. In the case of incomplete work in the spring semester, this requirement applies whether or not the student plans to attend one or more terms of summer session.

Students excluded from the School of Nursing under the provisions of this regulation may, upon request, have their cases reviewed by the Undergraduate Studies Committee of the School of Nursing. The faculty or the Dean reserves the right to withdraw any student whose health, conduct, or scholarship is such that it is inadvisable for the student to remain in the School of Nursing.

A minimum of fourteen courses must be passed before a student can proceed to the upper division professional curriculum. Twelve of these courses must have been passed with a grade of C-or better. All lower division requirements must be met before entry to the upper division.

Requirements for Degree. To be graduated, a student must pass a total of thirty-two courses (or equivalent combination of courses, half courses, and double courses), including courses in the approved curriculum. Fourteen courses must be passed at the advanced level. Of the thirty-two courses required for graduation, no more than two courses with *D* grades will be accepted. Only required nursing courses with a grade of C-or better will be accepted toward graduation. It is required that for graduation the student have an overall C average or better in nursing courses and that all financial obligations to the University be satisfied.

Residence Requirements. The requirements for the normal and maximum periods of residence for students enrolled in the School of Nursing are the same as those in Trinity College of Arts and Sciences. However, the minimum time that any student may spend in residence (full-time study) at Duke before receiving a Bachelor of Science in Nursing degree is one year if the student is a registered nurse completing the requirements for a Bachelor of Science in Nursing.

Withdrawal from the School of Nursing. Students who wish to withdraw from the School of Nursing must give official notification to the Dean of the School of Nursing. For students withdrawing on their own initiative prior to four weeks before the end of the semester, a *W* is assigned instead of a regular grade for each course. Thereafter, an *F* is recorded for each course unless withdrawal is caused by any emergency beyond the control of the student.

Transportation Required. The use of facilities other than Duke and Durham Veterans Administration hospitals requires transportation. It is the responsibility of each nursing student to provide a means of transportation to and from the facilities selected for learning experiences in both the junior and senior years. Although a few agencies may be within bicycling distance, most are not.

Accreditation. In addition to the accreditation status accorded the University, the undergraduate program of the School of Nursing is accredited by the National League for Nursing and the North Carolina Board of Nursing.

Other Policies. Unless otherwise specified, policies and procedures described throughout this bulletin apply to the School of Nursing. In particular note: advanced placement, transfer of work elsewhere, advising, registration, course load and eligibility for courses, course audit, independent study, house courses, class attendance, final examinations, excused absences, grading, commencement, change in status, transfer between Duke University schools, Reserve Officer Training, campus life and activities, admission, financial information.

Academic Procedures and Information



Advanced Placement

Scores on the tests discussed below and documented previous educational experience are the criteria used to determine a student's qualifications for certain advanced courses. If questions arise, students should consult the Director of Undergraduate Studies in the appropriate department.

College Board Advanced Placement Program (APP) Examinations. A score of 3, 4, or 5 on College Board Advanced Placement Program Examinations, taken prior to matriculation in college, is the basis for consideration for credit and placement in advanced courses in art, botany, chemistry, English,* French, German, history, Latin, mathematics, music, physics, Spanish, and zoology. The record of a student presenting such a score and desiring to continue in the same subject at Duke will be evaluated for credit and for placement in an advanced course. Departmental policies regarding advanced placement and credit may vary. In the case of French, German, Latin, and Spanish, APP scores of 3, 4, or 5 may result in placement in courses at the 100 level; approval of the Director of Undergraduate Studies or Supervisor of Freshman Instruction in the appropriate department is required before final placement is made. Credit may be granted for one or two courses in each subject area, with the approval of the academic department concerned. A student who has earned a score of 3 and who is granted deferred credit by individual department policy must complete a specified course in that subject at Duke with a grade of C or better before credit is awarded. Pass/fail grading is *not* an option for such courses. Ordinarily, the validating course must be completed by the end of the sophomore year. Several departments award neither credit nor placement for scores of 3. Also, see the section on residence requirements in the chapter "Degree Programs."

College Board Achievement Tests. Scores on College Board Achievement Tests are the basic criteria for placement in French, German, Italian, Spanish, Latin, and mathematics. Course credit is not given for courses bypassed. The following

*The score in English Advanced Placement, although qualifying a student for advanced courses in literature, does not satisfy the requirement in English composition.

tables will assist students in making reasonable course selections in the subjects indicated.

French*		German		Italian	
College Board Achievement Scores	Course Placement	College Board Achievement Scores	Course Placement	College Board Achievement Scores	Course Placement
200–390	French 1–2	200–390	German 1†	200–390	Italian 1–2
400–500	French 63	400–560	German 63	400–500	Italian 63
510–550	French 74, 76	570 plus	Third year‡	510–550	Italian 74
560 plus	French 100–level course§			560 plus	Italian 100–level course

Spanish*		Latin		Mathematics #	
College Board Achievement Scores	Course Placement	College Board Achievement Scores	Course Placement	College Board Achievement Scores	Course Placement
200–450	Spanish 1–2	200–520	Latin 1†	Less than 480	Math. 9–10
460–550	Spanish 63	530–630	Latin 63	490–540	Math. 19
560–600	Spanish 74, 76	640 plus	Third year‡	550–580	Math. 31A
610 plus	Spanish 100–level course§			590–800	Math. 31 or 33

*In these languages students are permitted to drop back one level without loss of credit (e.g., from 101 to 74 or from 74 to 63). No credit will be allowed for courses two levels below the achievement score (e.g., students with a score of 610 in French or Spanish could not receive credit for 63, but could for 74 or 76). In no case will credit be given for 1-2 to students with three or more years of high school French or Spanish.

†The first year of a language may *not* be taken for credit by a student who has completed more than two years of that language in secondary school. In rare cases, an exception may be granted with permission of the Director of Undergraduate Studies in the appropriate department.

‡An exception may be granted in consultation with the Director of Undergraduate Studies.

§French 111 and Spanish 110 are not open to first semester freshmen with a score of less than 700.

#In the absence of an Achievement Test score, course placement is determined by the SAT score as follows: 490 or below—Math. 9–10; 500–600—Math. 19; 610–650—Math. 31A; 660–800—Math. 31 or 33; 750–800—Math. 31X.

College Board College Placement Tests. The College Board Placement Tests in French, German, Italian, Latin, and Spanish should be taken during orientation by (1) those students who desire to continue in the language but have not taken the College Board Achievement Test, and (2) those students who, having taken the College Board Achievement Test, wish to challenge the score for the purpose of qualifying for a higher level language course. These tests should be taken also (3) by all students in Trinity College who are presenting just *two* units of high school credit (*grades 9–12, inclusive*) in a single foreign language and who have not taken the College Board Achievement Test in that language to demonstrate their proficiency. Taking the tests under these circumstances is necessary in order to ascertain whether the foreign language proficiency requirement has been met at entrance. See the statement on the requirement in the section on foreign language in the chapter “Degree Programs.”

All freshmen who plan to take mathematics during their first semester at Duke, and who do not submit the College Board SAT score or College Board Achievement Test score in mathematics, must take the College Board College Placement Test in mathematics during orientation. Students who have been placed in Mathematics 19 or 31 but believe that their background in mathematics justifies a higher course placement need not take the College Board College Placement Test, but they should consult the Director of Undergraduate Studies or Supervisor of Freshman Instruction in the Department of Mathematics.

Course credit is not given for courses bypassed on the basis of the placement tests.

Placement in Russian. Students who wish to continue in Russian at Duke should see the Director of Undergraduate Studies in the Department of Slavic Languages and Literatures. In the case of Russian, either College Board Achievement Test scores or College Board Placement Test scores serve as criteria for placement. Lacking these, the department offers an examination which is used in conjunction with other criteria for placing students at the appropriate course level.

Reading Out of Introductory Courses. Students demonstrating academic ability may be granted the option of reading out of an introductory or prerequisite course in order to allow them to advance at their own pace to upper level work. No course credit may be earned by reading out. Reading for a course and auditing are mutually exclusive procedures. Students must be recommended for the reading option by their academic deans, and their proposed programs of reading must be approved by the appropriate Director of Undergraduate Studies. Students may be certified for advanced course work by passing a qualifying examination prepared by the department. When an advanced course is completed, an entry is made on the permanent record that the qualifying examination was passed, but no course credit is awarded. Further information is available from the academic deans.

Transfer of Work Elsewhere

Evaluation of Work Taken Elsewhere. For students transferring from another accredited, degree-granting institution, credit of up to sixteen semester courses may be granted. Courses in which grades of less than C—have been earned are not accepted for transfer credit; students seeking transfer credit for courses in which they earned a *P* grade must present official verification that the *P* is equivalent to at least a C—grade. The semester-course unit of credit awarded at Duke for satisfactorily completed courses cannot, of course, be directly equated with semester-hour or quarter-hour credits. Ordinarily, transfer students will not be awarded more than four semester-course credits for one semester's work unless they have satisfactorily completed more than the normal course load at the institutions from which they have transferred. All courses approved for transfer are listed on the student's permanent record at Duke, but grades earned are not recorded. Courses taken at other institutions prior to matriculation at Duke are evaluated by the University Registrar and by the faculty.

Limitation on Work Taken Elsewhere. After matriculation as a full-time degree candidate in Trinity College of Arts and Sciences or the School of Nursing, a student may receive credit toward the Bachelor of Science or Bachelor of Arts or Bachelor of Science in Nursing degree for a maximum of two courses taken at another institution, whether in the summer while regularly enrolled at Duke, while withdrawn voluntarily from the college, or while on leave of absence (other than for an approved program of study abroad or an approved program at another institution in the United States). Full-time degree candidates in the School of Engineering may receive credit towards the Bachelor of Science in Engineering degree for a maximum of six courses taken at another institution. Ordinarily, no

credit will be accepted for course work taken while a student is withdrawn involuntarily. For purposes of this regulation, advanced placement credit is not considered as work taken at another institution. The provision of the residence requirement which allows a student to take the final courses elsewhere remains in effect. See the section on residence requirements in the chapter "Degree Programs."

Students may not transfer credit from two-year colleges after completing their sophomore year. At least half the courses submitted toward fulfillment of a student's major field must be taken at Duke, but departments may make exceptions to this rule in special circumstances. No credit is given for work completed by correspondence, and credit for not more than two semester courses is allowed for extension courses.

Approval for Courses Taken Elsewhere. Approval forms for courses to be taken at institutions other than Duke may be obtained from the offices of the academic deans. Students wishing to transfer credit for study at another accredited college while on leave or during the summer must present a catalog of that college to the appropriate dean and Director of Undergraduate Studies and obtain their approval *prior* to taking the courses.

Advising

Students and their advisers confer when necessary, but they should confer at least once before every registration period to review goals, plans for achieving them, and any problems encountered or anticipated. Before declaring a major in Trinity College, students confer with the premajor adviser, the academic dean for premajor students, or the academic dean in the division of their interests. Upon declaring a major, the student is assigned a faculty adviser; the academic dean for that division is also available for consultation. In the School of Engineering and the School of Nursing, the adviser's signature is necessary for registration and all course changes. Much good advising is informal and occurs in conversation with members of the faculty.

Registration

Students are expected to register at specified times for each successive term. Prior to registration each student receives special instructions and registration materials. Students prepare a course program, submit it at an appointed time to their advisers for review, and present the approved schedule at registration. In the School of Engineering and the School of Nursing, the schedule must be signed by the adviser.

Students who expect to obtain certification to teach in elementary or secondary schools should consult an adviser in the education program prior to each registration period to ensure that they are meeting requirements for state certification and that they will have places reserved for them in the student teaching program.

Those who register late are subject to a \$25 fine. Students who fail to register for the fall or spring semester are withdrawn and must apply for readmission if they wish to return; they also forfeit their registration deposits unless they indicate at the time of registration their intention not to continue in the University the following term. Those students who have not paid any fees owed to or fines imposed by the University (such as laboratory fees, library fines, and parking fines) by the date specified for registration for the following term will not be permitted to register for the following term until such fees and fines have been paid in full, notwithstanding the fact that the student may have paid in full the tuition for the following term.

Students planning to register for a course under the reciprocal (interinstitutional) agreement must have the course approved by the appropriate Director of Undergraduate Studies and their academic dean. Further information about registration procedures once approval is given may be obtained from the Office of the Registrar. See the chapter "Special Programs" for information regarding the reciprocal agreement with neighboring universities.

Term Enrollment and Identification Cards. Students are to report to 103 Allen Building at the beginning of each term to obtain enrollment cards. (These cards should be carried at all times along with identification cards which are issued at the time of matriculation.) Failure to report, or to account beforehand for an absence, entails a loss of registration in courses. Official enrollment is required for admission to any class. Students who will not be attending a summer term for which they registered (course card submitted), must officially drop the courses prior to the beginning of class whether or not they have paid tuition and fees. See the chapter "Financial Information" concerning summer refunds and withdrawal charges.

The enrollment and identification cards are means of identification for library privileges, University functions, and services available to University students. Students are expected to present their cards on request to any University official or employee. The cards are not transferable, and fraudulent use may result in loss of student privileges or suspension. Loss of the cards should be reported immediately to the Office of the Registrar where new ones can be obtained for \$5.

Concurrent Enrollment. A student enrolled at Duke may not enroll concurrently in any other school or college without special permission of the appropriate academic dean. See, however, the statement regarding the reciprocal agreement with the University of North Carolina at Chapel Hill, North Carolina Central University in Durham, and North Carolina State University at Raleigh.

Course Changes after Classes Begin in the Fall and Spring Terms. During the drop/add period changes may be made in course schedules. Receipts for course changes made in 103 Allen Building must be retained.

In Trinity College of Arts and Sciences, students may drop and add courses during the first week of classes in the fall and spring terms at their own discretion; during the second week of the drop/add period they may drop courses at their own discretion, but the signature of the appropriate instructor is required for adding a course. After the drop/add period no course may be added; also, a course may not be changed to or from the pass/fail or audit basis. To withdraw from a course, students must obtain permission from their academic deans, and for reasons of course overload the academic dean may give permission up to midterm. Ordinarily, courses may not be discontinued after midterm. In extraordinary circumstances, however, e.g., for reasons of health, the academic dean may allow a student to withdraw. After the drop/add period, the student receives a *WP* grade (withdraw passing) or *WF* (withdraw failing) from the instructor. Course work discontinued without the dean's permission will ordinarily result in a grade of *F*.

Within the School of Engineering and the School of Nursing, the signature of the adviser is necessary for dropping or adding courses after classes begin. After the drop/add period no course may be added, and in order to withdraw from a course students must obtain permission from their academic deans. Factors to be considered by the dean include health, necessary outside work, and, up to the time midterm grades are issued, a course overload. Until the last four weeks of classes in the semester, the instructor must certify the student's standing in the course as satisfactory or as failing. In the former case a *WP* will be entered on the permanent record and in the latter, a *WF*. During the last four weeks of classes in any semester, or the equivalent in the summer terms, *W* will be assigned if, in the judgment of the student's dean, compelling and extraordinary circumstances make

it necessary for the student to drop the course; otherwise, the course must be continued to the end of the semester. A course discontinued without approval will result in a grade of *F*.

When students note an error in their course schedules, they should consult with their academic dean.

Course Changes for the Summer Terms. Prior to or during the first three days of classes in a summer term, a student may add or drop a course or term by completing and submitting the three-part drop/add form(s) to the Office of the Summer Session, 121 Allen Building. (See the section on summer refunds and withdrawal charges in the chapter "Financial Information.") After May 3 all course changes must be approved by the appropriate academic dean. The Director of the Summer Session serves as the dean for non-Duke students. Students who are out of town must contact their academic dean directly to arrange for dropping or adding courses. After the third day of class no course may be added. With permission of the academic dean, a course may be dropped until the end of the fourteenth class day of a regular summer term; the instructor then assigns a *WP* or *WF* grade. Course work discontinued without approval of the dean will result in a grade of *F*. In all cases, students should retain the copy of the form confirming any changes.

Course Load and Eligibility for Courses

Students are reminded that it is their responsibility to be certain that their course load conforms with academic requirements. The normal and expected course load in the fall or spring term is four semester courses. To take fewer than four or more than five semester courses, students must have the approval of their academic deans. No student, however, may take more than six courses in any semester. With the approval of their academic advisers and the Dean, seniors in the School of Nursing who need fewer than eight semester courses for graduation requirements may take a three-course load either semester; seniors in Trinity College and the School of Engineering need permission of the appropriate academic deans.

Maximum course program for one term of the summer session is two courses, one of which may be a laboratory course. In addition, a student may enroll in a physical education activity or dance activity course for one-half course credit.

Self-pacing during a given calendar year (two regular semesters plus two Duke summer terms) is possible with the approval of the student's academic dean and faculty adviser (and in consultation with the Office of Undergraduate Financial Aid, if the student is receiving monetary support from the University). Prior to the beginning of a semester, a student may apply to take fewer than four courses for one or more semesters in a given calendar year after the freshman year, providing the student can meet the continuation requirements described in the chapter "Degree Programs." Advanced placement credits and summer work taken elsewhere are excluded when minimum annual continuation requirements are considered under this plan.

Eligibility for Courses. The rules established by the Graduate School provide that juniors and well-qualified sophomores may enroll in a 200-level (senior-graduate) course if they have obtained written consent of the instructor, as well as that of the Director of Graduate Studies in the department concerned. Within the School of Nursing, 200-level courses are open to nursing seniors and nursing graduate students. Nonnursing students may enroll only with the permission of the instructor. Undergraduate students may not enroll in 300- or 400-level courses.

Seniors who, at the beginning of a term, lack no more than three semester courses toward the fulfillment of the requirements for the Bachelor of Arts or

Bachelor of Science degree may enroll in graduate courses, for a maximum course load of five semester courses. Admission to the Graduate School is necessary.

Students may not register for two courses meeting at the same time. In Trinity College and the School of Nursing no course may be repeated for credit or a grade if a passing grade has been earned previously, except where noted in the course description. A course previously passed, however, may be audited.

Course Audit

Students who audit a course submit no daily work and take no examinations. They do not receive credit for the course. With the written consent of the instructor, a full-time degree student is allowed to audit one or more courses in addition to the normal program. Physical education activity, studio art, applied music, and dance activity courses may not be audited. In the fall or spring term, a part-time degree student may audit courses by payment for each course audited. In a summer term, a student carrying two courses for credit may be given permission to audit, without additional fees, nonlaboratory courses with the above exceptions. A student in a summer term carrying less than a full program for credit may secure permission to audit (above exceptions apply) but is required to pay half the University fee for the course. After the drop/add period in any term, no student classified as an auditor in a particular course may take the course for credit, and no student taking a course for credit may be reclassified as an auditor. A student may not repeat for credit any course previously audited.

Faculty members, staff, alumni, employees and their spouses, as well as spouses of currently enrolled students, and members of the Institute for Learning in Retirement may audit courses without enrolling concurrently in another course. Formal application is not necessary: written permission from the instructor must be obtained and a course card must be signed by the Director of the Office of Continuing Education. Consult the chapter "Financial Information" for the appropriate fee schedule. Auditors must register on the Friday before classes begin.

Independent Study

Independent study enables a student to pursue individual research and reading in a field of special interest under the supervision of a member of the faculty. A student—with the approval of an adviser, the instructor, and the Director of Undergraduate Studies in the instructor's department—may enroll in independent study for any term at Duke. In Trinity College, instructors of independent study courses are expected to meet with the students enrolled at least once every two weeks during the fall or spring and at least once each week during a summer term. In the School of Nursing, students must have the approval of their academic advisers, faculty sponsors, and the coordinator for independent study. Such studies may have a clinical or field component.

House Courses

House courses, offered in the fall and spring terms, are organized by students within given residential units. They are intended to encourage students to take initiative in creating academic experiences that are not offered by the departments. If students are to earn credit for a course, it must be sponsored by a faculty member in the arts and sciences, reviewed by the department of that faculty member, and approved by the Committee on Courses of Instruction of the Undergraduate Faculty Council of Arts and Sciences. In the School of Nursing, house courses are initiated and organized by students and faculty, and each house course must be approved by the Undergraduate Studies Committee and the School of Nursing

faculty. House courses may carry half-course credit, but not more than two semester-course credits earned in house courses may be counted toward the course requirement for graduation. House courses do not count toward other requirements. Grades are submitted on the pass/fail basis. The academic deans can provide further details.

Submission of Term Paper

Students who wish (under unusual circumstances) to submit a single paper for credit in more than one course must receive prior written permission from each course instructor. The student must indicate the multiple submission on the title page of the paper.

Declaration of Major or Division in Trinity College of Arts and Sciences

Each freshman must declare a division of interest (humanities, social sciences, or natural sciences), or a major, if desired, by registration in March of the freshman year. All students must declare a major before beginning classes for their fourth undergraduate semester. When a student declares a major, the second and third divisions must also be identified. Forms for registering an initial declaration of major are available to students in the Trinity College Center for Premajor Advising. A student who, having already declared a major, wishes to change his or her area of concentration, completes a form in the Office of the Registrar.

The second major should be declared in the Office of the Registrar before the student registers for the final term. A change of departmental major or interdepartmental concentration must also be made in the Office of the Registrar. After declaring a major, a student is assigned an adviser in the department of the major and an academic dean in the division of concentration. Freshmen who declare a division rather than a major are advised by an adviser in the Premajor Center.

A student may declare an interdepartmental concentration after conferring with the Directors of Undergraduate Studies of the departments involved, and they or other advisers assist the student in preparing a program of course work. The program, which must be planned early in the undergraduate career, must consist of at least three courses beyond the introductory level in each of the departments. One of the departments should be identified as primarily responsible for the student's advising. A copy of the plan for the program, with a descriptive title which will appear on the student's permanent record, should be presented, along with the written approval of the Directors of Undergraduate Studies, to the appropriate academic dean. A student who declares an interdepartmental concentration must identify the second and third divisions and satisfy those requirements and all others for Program I.

A student may have a second major recorded on the permanent record; if the student's second major is not offered within the degree to be granted for completion of the first major, a notation of the second major will appear on the transcript. Majors offered within each degree are listed below:

Bachelor of Arts. Afro-American studies, anthropology, art design, art history, biology, botany, Canadian studies, chemistry, classical studies (ancient history and archaeology), comparative area studies, comparative literature, drama, economics, English, French, geology, Germanic languages and literature, Greek, history, Latin, mathematics, medieval and Renaissance studies, music, philosophy, physics, political science, psychology, public policy studies, religion, Slavic languages and literatures, sociology, Spanish, zoology.

Bachelor of Science. Biology, botany, chemistry, computer science, geology, mathematics, physics, psychology, zoology.

Changes in Status

Withdrawal and Readmission. Students who wish to withdraw from the college must give official notification to their academic dean. Notification must be received prior to the beginning of classes in any term or tuition will be due on a pro rata basis. (See the section on refunds in the chapter "Financial Information.") For students withdrawing on their own initiative after the beginning of classes and prior to the last four weeks of regular classes in the fall or spring term, or before the last two weeks of regular classes in a summer term, a *W* is assigned in lieu of a regular grade for each course. After these dates an *F* grade is recorded unless withdrawal is caused by an emergency beyond the control of the student, in which case a *W* is assigned by the student's academic dean.

Applications for readmission are made to the appropriate school or college. Each application is reviewed by officers of the school or college to which the student applies, and a decision is made on the basis of the applicant's previous record at Duke, evidence of increasing maturity and discipline, and the degree of success attendant upon activities during the time away from Duke. Students who are readmitted usually cannot be housed on campus.

Applications for readmission must be completed by December 1 for enrollment in January, by April 1 for enrollment in the summer, and by August 1 for enrollment in September. For readmission to the School of Nursing, however, it is required that the readmission procedure be completed by February 1 for September enrollment and by November 1 for January enrollment.

Leave of Absence. An upperclassman in good standing may apply in writing to the appropriate academic dean to take a leave of absence for one or two semesters; the deadline for application for a leave is the end of the registration period for the semester immediately preceding the leave. Students returning from approved medical, financial, or study abroad leaves and desiring housing on campus will be placed in the general housing lottery, provided they have submitted the appropriate information to the Office of Student Affairs by the deadline noted above and provided that they lived on campus before taking their approved leave. Those students approved for personal leaves are not guaranteed on-campus housing, but will be given highest priority on the housing waiting list provided the same deadline and qualifications described above have been met. Unless an exception for an emergency is authorized by the students' academic deans, students applying after the course registration cited above will lose their priorities in University housing for the period following the leave.

Registration materials will be mailed to a student on leave, but final registration is, of course, contingent upon the student's fulfilling the terms of the leave. A student failing to register while on leave will be withdrawn from the University and will have to apply for readmission.

A student who undertakes independent study under Duke supervision and for Duke credit is not on leave of absence even if studying elsewhere. The student registers at Duke as a nonresident student and pays the appropriate fees or tuition at Duke. This also applies to Duke programs conducted away from the Durham campus.

Transfer between Duke University Schools. Students in good standing may be considered for transfer from one Duke undergraduate school or college to another, upon written application and request for a letter of recommendation from their academic dean. The review of requests to transfer involves consideration of a student's general academic standing, citizenship records, and relative standing in the group of students applying for transfer. The school or college to which transfer is sought will give academic counseling to a student as soon as intention to apply for transfer is known, although no commitment will be implied.

A student may apply to transfer at any time prior to or after receiving a baccalaureate degree. A student transferring to Trinity College of Arts and Sciences from the School of Engineering or the School of Nursing, prior to receiving a baccalaureate degree, may not use more than six professional school credits toward the Bachelor of Arts or Bachelor of Science degree. If admitted after having earned a baccalaureate degree, a student must undertake prescribed additional undergraduate work to qualify for a second baccalaureate degree.

Full-Time and Part-Time Degree Status. Ordinarily candidates for degrees are expected to enroll for a normal course load each semester. Students who need to change from full-time status to part-time status must request permission from their academic dean. For special reasons approved by the dean, a full-time student, who is qualified to continue, may register as a part-time student for not more than two courses (or two courses and a half-credit physical activity or dance activity course) during the fall and spring. Part-time students may not live in the residence halls.

Resident and Nonresident Status. See the chapter "Campus Life and Activities."

Nondegree to Degree Status. A nondegree student must apply to the Office of Undergraduate Admissions for admission to degree candidacy.

Class Attendance, Excused Absences, and Tests

Responsibility for class attendance rests with the individual student, and since regular and punctual class attendance is expected, the student must accept the consequences of failure to attend. Instructors may refer to the student's academic dean a student who is, in their opinion, absent excessively. As a rule, absences from required classes and tests are excused only for illnesses certified by a medical official of the University or for authorized representation of the University in out-of-town events. Officials in charge of groups representing the University are required to submit the names of students to be excused to the appropriate deans' offices forty-eight hours before absences are to begin.

Class times are officially scheduled at registration unless designated "to be arranged" (TBA). No class time may be changed without prior permission of the University Schedule Committee. Within-class tests (except for the final) are to be given at the regular class meeting times. Exceptions are made for block tests that have been approved by the University Schedule Committee. Hours set up for block examinations are 7:30 to 8:45 A.M. on Tuesdays and Thursdays.

Incompleted Course Work

If because of illness, emergency, or reasonable cause a student cannot complete work for a course, the student may request in writing the assignment of an *I* (incomplete) for the course. If the request is approved by the instructor in the course and by the student's academic dean, then the student must satisfactorily complete the work prior to the last weekday of classes of the subsequent semester or a grade of *F* will be recorded for the course. An *I* taken in the fall semester must be resolved in the succeeding spring term; an *I* taken in the spring or summer must be completed in the the following fall term. A student not enrolled in the University during that subsequent semester will have until the end of the next semester of matriculation to clear the *I*. If a student whose work is incomplete is also absent from the final examination, an *X* is assigned for the course. Students may not complete work in a course after graduation. For a discussion of the possible impact of an *I* grade on continuation, see the sections on satisfactory performance each term in the chapter "Degree Programs."

Final Examinations and Excused Absences

Unless departmental policy stipulates otherwise, the form of the final exercise is determined by the instructor. However, a final written examination may not exceed three hours in length and a final take-home examination may not require more than three hours in the actual writing. Take-home examinations are due at the regularly scheduled hour of an examination, based on the time period of the class. The times and places of final examinations for the fall and spring terms are officially scheduled by the University Schedule Committee, generally according to the day and hour of the regular course meeting; changes may not be made in the schedule without the approval of the committee. If a final examination is to be given in a course, it will be given at the officially scheduled time. Final examination dates can not be changed from the officially announced ones without permission of the Schedule Committee. No later than the end of the first week of classes of the fall and spring term, the instructor is required to announce plans for the final examination exercise. In fall or spring courses where final examinations are not scheduled, examinations may not be given in the last week of classes. In the summer session, final examinations are held on the last two days of each term as specified in the summer session brochure calendar. Final examinations for short courses are held on the last day of the course.

If a student is absent from a final examination, an X is given instead of a final grade. *An acceptable explanation for the absence must be presented to the appropriate academic dean within forty-eight hours after the scheduled time of the examination, or the X is converted to an F.* If the absence is excused by an academic dean, the student arranges with the dean and the instructor for a make-up examination to be given at the earliest possible time. An excused X not cleared by the end of the following semester is converted to an F. A student not enrolled in the University during that following semester has until the end of the next semester of enrollment to clear the X unless an earlier deadline has been established by the instructor and the academic dean.

Grading and Grade Requirements

Final grades on academic work are sent to students after the examinations at the end of each term. Midterm advisory grade reports for freshmen are issued in the fall and spring.

Passing Grades. Passing grades are *A*, exceptional; *B*, superior; *C*, satisfactory; *P*, passing (see pass/fail option below); and *D*, low pass. These grades may be modified by a plus or minus. A *Z* may be assigned for the satisfactory completion of the first term of a two-course sequence, and the final grade for both courses is assigned at the end of the second course of the sequence.

Although the *D* grade represents low pass, in Trinity College not more than two courses passed with *D* grades may be counted among those required for year-to-year continuation or among the thirty-two courses required for graduation. Courses for which a *D* grade is earned, however, satisfy other requirements. Trinity College students may *not* repeat for credit any course in which a *D* grade or higher was earned.

Failing Grades. A grade of *F* or *U* (see pass/fail option below) indicates that the student has failed the course. The grade is recorded on the student's record. If the student registers for the course again, a second entry of the course and the new grade earned are made on the record, but the first entry is not removed.

Pass/Fail Option. With the consent of the instructor and faculty adviser, a student who has declared a major may register for grading on a pass/fail basis in one elective, nonmajor course each term. In addition, with the consent of the instructor, adviser, and Director of Undergraduate Studies, a student may take for

pass/fail credit courses in independent study or internship in any department including that of the major. Certain courses are offered only on a pass/fail basis. Unless a course is offered only on a pass/fail basis, a course passed under the pass/fail option does not satisfy distributional or fields of knowledge requirements.

After the drop/add period in any term, no changes from pass/fail to regular status, or from regular to pass/fail status, are permitted in any course. A *P* may not be converted subsequently to a regular letter grade, and the course may not be retaken under the regular grading system.

Grades When Absent from Final Examination. See the section on final examination and excused absences in this chapter.

Grades for Incompleted Work. See the section on incompleted work in this chapter.

WP, WF, and W Grades, and WE Designation. *WP* and *WF* grades may be issued if a student withdraws from a course after the drop/add period. (See the sections on course changes in this chapter.) *W* grades are issued if a student withdraws from the University before the last four weeks of regular classes in the fall or spring semester, or before the last two weeks of classes in a regular summer term. (See the section on withdrawal and readmission in this chapter.)

WE indicates correction of an error in registration. It is not a grade.

Academic Recognition and Honors

In determining a student's eligibility for annual recognition and graduation honors, the colleges consider only grades earned in Duke courses, including courses taken in the University's own study abroad programs and under the interinstitutional agreement.

Annual Recognition. In acknowledgement of high academic achievement, recognition is given each summer to freshmen, sophomores, juniors, and seniors if the following requirements are met:

1. A normal academic load has been carried in the fall and spring terms.
2. Grades other than *P* have been earned in six semester courses.
3. No incomplete or failing grade has been received during the fall and spring terms.

Class Honors are awarded to students who earn a *B+* average on all work in both the fall and spring terms of an academic year.

The *Dean's List* recognizes students who earn a *B* average on all work in both the fall and spring terms.

Graduation Honors. Students who earn the following averages for all grades recorded at Duke are graduated with honors: 3.3 average, *cum laude*; 3.6 average, *magna cum laude*; 3.8 average, *summa cum laude*.

Graduation with Distinction. Most of the academic departments have programs for graduation with distinction for students in Programs I and II and in all nursing and engineering programs. To be eligible for this honor, students in Programs I and II and in engineering programs must show promise of achieving, by the time of graduation, at least a *B* average in the major field. In addition, in the School of Engineering, some departments require at least a *B* average in all subjects and may have additional requirements.

Departments or interdepartmental honors committees may invite a student at the end of the sophomore or junior year to enter the Graduation with Distinction Program. After participation in a seminar in the junior or senior year, and/or a directed course of reading, laboratory research, or other independent study, the

student must present the results of individual research and study in a distinguished piece of writing. The student's achievement, including the paper, is assessed by a faculty committee, and if the student has at least a *B* average in the major field, the committee may recommend that the student be graduated with distinction in the major field. A student engaged in an interdisciplinary program, including Program II, must attain an overall *B* average for courses taken in the departmental area of concentration or special study. Achievement is assessed by an interdepartmental honors committee established by the Directors of Undergraduate Studies in the departments concerned. Interested students should consult the appropriate Directors of Undergraduate Studies.

In the School of Nursing, graduation with distinction allows the capable student to develop critical thinking, and to develop or expand knowledge in the study of a nursing problem with faculty guidance and with public recognition for demonstrated mastery. The student must have a *B+* average in all nursing courses at the beginning of the senior year and at the end of the senior year to be eligible for graduation with distinction. For more information about graduation with distinction, students should contact the coordinator for the honors program in the School of Nursing.

Other Honors. Elections to the freshman honorary society, Phi Eta Sigma, are made at the end of the fall and spring semesters. Freshmen who earn a 3.5 average in four or more semester courses in their first semester of enrollment, or those whose cumulative average at the end of their second Duke semester is 3.5 or above in a program of eight or more semester courses, are invited to membership.

Elections of undergraduate students in Trinity College and the School of Engineering to membership in the national honorary society, Phi Beta Kappa, are held in the spring and fall. A review of the academic record of all prospective candidates is conducted in the junior and senior years as well as in the term following graduation. (Doctoral students are, on the other hand, nominated by their department.) Eligibility for election is determined not by the University, but by the local chapter of the society. No less than four-fifths of earned and transferred credits must have been taken on the regular grading system (*A-F*). The total number of persons elected annually is limited by bylaw to 10 percent of the graduating class. Inquiries concerning distribution requirements for students in the School of Engineering should be directed to Professor Rhett George, Department of Electrical Engineering. All other inquiries may be directed to the Secretary of Phi Beta Kappa, Box 4795, Duke Station, Durham, North Carolina 27706.

Elections to the national engineering honorary society, Tau Beta Pi, are held in the fall and spring. Eligibility is determined on the basis of distinguished scholarship and exemplary character. Engineering students whose academic standing is in the upper eighth of the junior class or the upper fifth of the senior class have earned consideration by their local chapter. Inquiries may be directed to: Advisory Board, Tau Beta Pi, School of Engineering, Duke University, Durham, North Carolina 27706.

Election to the national nursing honorary society, Sigma Theta Tau, is made in the spring. Both juniors and seniors in the School of Nursing and outstanding members of the profession are elected at this time. Eligibility is determined on the basis of scholarship (students must have a *B* average), leadership, variety of outside activities, interest in nursing, and potential for excellence in the profession. Inquiries may be directed to: Sigma Theta Tau, Duke University School of Nursing, Durham, North Carolina 27710.

Students interested in various prestigious fellowships for graduate study (for example, the Winston Churchill, Rhodes, Marshall, Luce, or Fulbright-Hays) should consult the academic dean in charge of fellowships, 116 Allen Building. Specific information about deadlines and procedures is available through this office.

Notification of Intention to Graduate

The Diploma Card for students in Trinity College of Arts and Sciences and the School of Engineering is official notification that they expect to have completed all requirements for the degree and to receive the diploma on a particular graduation date. In the School of Nursing, a form requesting this information is sent from and should be returned to the Dean's office. It is the responsibility of students to file the card or form on or before established deadlines. For students in Trinity College, the cards, to be filed during the fall registration period, are available in the College Recorder's office; in the School of Engineering, the Dean's office.

Commencement

Graduation exercises are held once a year in May when degrees are conferred upon and diplomas are issued to those who have completed degree requirements by the end of the spring term. Those who complete the requirements by the end of the summer term or by the end of the fall term receive diplomas dated September 1 or December 30, respectively. There is a delay of one month to two months in the mailing of September and December diplomas because diplomas cannot be issued until they are approved by the Academic Council and the Board of Trustees.

Prizes and Awards

The achievements of undergraduate students are recognized in various fields of activity. The following prizes suggest the range of recognition.

The Robert E. Lee Prize. This prize was initiated by the late Reverend A. W. Plyler, of the Class of 1892, and Mrs. Plyler and continued through the generosity of Mrs. Richard B. Maxwell, Jr., of the Class of 1942. The sum of \$50 is awarded annually at commencement to the person in the senior class of Trinity College of Arts and Sciences or the School of Engineering who, in character and conduct, scholarship, athletic achievement, and capacity for leadership, has personified most nearly the standards of the ideal student.

Julia Dale Prize in Mathematics. This is an annual prize of at least \$50. The winner is selected by the Department of Mathematics on the basis of excellence in mathematics. In some years first and second prizes are given.

The Henry Schuman Music Prize. A prize of \$100 is awarded annually to an undergraduate of Duke University for an original composition of chamber music or a distinguished paper in music history or analysis. The award is sponsored by the Department of Music through a continuing gift from Dr. and Mrs. James H. Semans who named the prize after Henry Schuman, a lifelong friend of the Semans and Trent families, a talented amateur violinist, and one who helped to build valued collections in the Duke library.

The Edward H. Benenson Awards. These awards of up to \$5,000 each will be given annually to undergraduates with an interest in art, music, drama, or creative writing to broaden students' educational and professional objectives. Those interested should consult the Chairman of their major department.

The Phi Lambda Upsilon Prize. Phi Lambda Upsilon, the honorary chemical society, annually awards a prize of \$20 to the junior chemistry major (A.B. or B.S.) having the highest overall academic average. The recipient's name is inscribed on a plaque displayed in the Chemistry Library.

The Chemistry Department Award. This prize is awarded annually to an outstanding chemistry major, usually receiving a B.S. degree. The basis for selection is the student's independent research and interest in pursuing advanced work in chemistry. The prize is a one-year subscription to an appropriate journal.

The Merck Index Award. This prize is awarded annually to one or two graduating chemistry majors intending to pursue a career in medicine. Selection, by a faculty committee, is based on scholastic excellence. The prize consists of a copy of the Merck Index presented by Merck and Co., Inc.

The James B. Rast Memorial Award in Comparative Anatomy. The parents of James Brailsford Rast, a member of the Class of 1958 of Duke University, endowed this award in his memory. The award, consisting of the *Atlas of Descriptive Human Anatomy* by Sobotta and bearing the James B. Rast Memorial bookplate, is given annually to the student who demonstrates the greatest achievement in the study of comparative anatomy.

The Winfred Quinton Holton Prize in Primary Education. This prize was established in 1922 by gifts of Holland Holton, Class of 1907, and Lela Young Holton, Class of 1907, in memory of their son,

Winfred Quinton Holton, with the income to be used to provide a prize for investigative work in primary education. This prize of approximately \$175 may be made annually. Competition is open to Duke seniors and graduate students who are eligible to obtain certification to teach in elementary schools. A student who wishes to be considered for the prize must submit a paper to be judged by a faculty committee in the education program.

The Anne Flexner Memorial Award in Creative Writing. This award has been established by the family and friends of Anne Flexner, who was graduated from Duke in 1945. It consists of \$200 (first prize), \$100 (second prize), and \$50 (third prize). The awards are given annually for the best pieces of creative writing submitted by Duke undergraduates. The competition is limited to short stories (7,500-word limit), one-act plays (7,500-word limit), and poetry (100-line limit).

The David Taggart Clark Prize in Classical Studies. This prize is awarded to the senior major in Greek, Latin, or classical studies who is judged to have written the best honors essay of the year.

The William Senhauser Prize. Given by the mother of William Senhauser in memory of her son, a member of the Class of 1942, who gave his life in the Pacific theater of war on August 4, 1944. This award is made annually to the student in Trinity College of Arts and Sciences or the School of Engineering who has made the greatest contribution to the University through participation and leadership in intramural sports. The winner of this prize is chosen by a committee appointed by the President of the University.

The Roger Alan Opel Memorial Scholarship. A grant is awarded annually to a Duke student who will spend a year of undergraduate study at a British university. The student is selected on the basis of intellectual curiosity, academic ability, and financial need. The award was established by the parents of Roger Alan Opel, a senior at Duke University who was killed in November, 1971.

The William T. Laprade Prize in History. This prize is offered in honor of William T. Laprade, who was a member of the Department of History at Trinity College and Duke University from 1909 to 1953, and Chairman of the department from 1938 to 1952. It is awarded to a senior who is being graduated with distinction and whose senior essay in history has been judged to be unusually meritorious.

The Edward C. Horn Memorial Prize for Excellence in Zoology. Given each year to the graduating zoology major who has shown, in the opinion of the zoology faculty, the highest level of academic achievement and promise, this prize is offered in memory of Professor Edward C. Horn. It is a tribute to his warm regard for students and faculty and his appreciation of scholarly excellence. The prize consists of books appropriate to the student's field of interest.

Alona E. Evans Prize in International Law. An annual award to an undergraduate and/or graduate student in arts and sciences whose paper(s) on international law reflect(s) excellence in scholarship. Prizes of not more than \$250 each are derived from income earned on the generous bequest of Professor Alona E. Evans, A.B. '40, Ph.D. (political science) '45.

Robert S. Rankin Political Science Award. An annual award of \$100 is given to the most outstanding student in the field of American government and constitutional law. The funds are donated in memory of Professor Rankin by Judge Jerry B. Stone, A.B. '44, J.D. '48.

N. Joseph Rahall Political Science Award. An annual award of \$100, contributed by Mr. Rahall, A.B. '35, is to be awarded for the best paper submitted by an undergraduate major in political science.

The Karl E. Zener Award for Outstanding Performance of a Major in Psychology. The Karl E. Zener Award is given to a psychology major who has shown outstanding performance and scholarship. The award, based on the student's total grade record and a paper submitted to the award committee, consists of a monetary prize and inclusion by name on a memorial plaque in Zener Auditorium.

The Richard L. Predmore Award in Spanish. Given each year to an outstanding Spanish major in honor of Richard L. Predmore, Professor of Spanish at Duke University from 1950-1978 and Dean of the Graduate School from 1962-1969.

The Robert J. Niess Award in French. Given each year to an outstanding French major in honor of Robert J. Niess, Professor of French at Duke University from 1972 to 1981.

The Walter J. Seeley Scholastic Award. This award is presented annually by the Engineers' Student Government to that member of the graduating class of the school who has achieved the highest scholastic average in all subjects, and who has shown diligence in pursuit of an engineering education. The award was initiated to honor the spirit of academic excellence and professional diligence demonstrated by the late Dean Emeritus Walter J. Seeley. It is hoped that this award will serve as a symbol of the man and the ideals for which he stood. The name of the recipient is inscribed on a plaque displayed in the Engineering Building.

The American Society of Civil Engineers Prize. The prize is awarded annually by the North Carolina Chapter of the American Society of Civil Engineers to two outstanding civil engineering seniors, upon recommendation of the faculty of the civil engineering department. The basis for selection is the student's scholastic record, contribution to the student chapter, and participation in other college activities and organizations. The prize consists of a certificate of award and the payment of one year's dues in the American Society of Civil Engineers.

The George Sherrerd III Memorial Award in Electrical Engineering. This award is presented annually to the senior in electrical engineering who, in the opinion of the electrical engineering faculty, has attained the highest level of scholastic achievement in all subjects and has rendered significant service to the School of Engineering and the University at large. The award was established in 1958 by

the parents of George Sherrerd III, a graduate of the Class of 1955, to recognize outstanding undergraduate scholarship. Recipients receive a monetary award, and their names are inscribed on a plaque displayed in the Engineering Building.

The Charles Ernest Seager Memorial Award. This award recognizes outstanding achievement in the annual Student Prize Paper Contest of the Duke branch of the Institute of Electrical and Electronics Engineers or significant contributions to electrical engineering. The award, established in 1958 by the widow and friends of Charles Ernest Seager, a graduate of the Class of 1955, consists of inscribing the name of the contest winner on a plaque displayed in the Engineering Building.

The Milnow Prize. This prize is awarded annually to students from North or South Carolina graduating in the Department of Electrical Engineering, who, in the opinion of the faculty of that department, and, as shown by their grades, have made the most progress in electrical engineering during the last year in school. The prize consists of a certificate of award and one year's payment of dues in the Institute of Electrical and Electronics Engineers for the membership year in which the honoree is awarded the baccalaureate degree.

The Raymond C. Gaugler Award in Materials Science and Engineering. This award is presented annually to the senior who has made the most progress at Duke in developing competence in materials science or materials engineering. The basis for selection is the student's scholastic record, research, or design projects completed at Duke, and interest in a materials-related career. The award has been established by Patricia S. Pearsall in memory of her grandfather, Raymond C. Gaugler, who was President of the American Cyanamid Company prior to his death in 1952.

The American Society of Mechanical Engineers Award. This award is presented annually to a senior in mechanical engineering for outstanding efforts and accomplishments in behalf of the American Society of Mechanical Engineers Student Section at Duke. The award consists of a certificate of recognition.

The School of Engineering Student Service Award. This award, established in 1978, is given to those graduating seniors who, by their contributions of time, effort, and spirit, have significantly benefited the community of the School of Engineering. The names of the recipients are inscribed on a plaque displayed in the Engineering Building.

The Theodore C. Heyward Award. This award is presented annually to an outstanding senior in mechanical engineering at Duke University. The recipient is chosen by a committee of the mechanical engineering faculty and selection is based on academic excellence, engineering ability, and leadership. The recipient receives a monetary award and his or her name is inscribed on a plaque displayed in the Engineering Building.

The William Brewster Snow Award in Environmental Engineering. This award is presented to an outstanding senior in civil engineering who, through superior academic achievement and extracurricular activities, has demonstrated interest and commitment to environmental engineering as a career. Selection of the recipient is made by the civil engineering faculty. The recipient is presented with an inscribed plaque and his or her name is also inscribed on a plaque permanently displayed in the Engineering Building.

The Otto Meier, Jr. Tau Beta Pi Award. This award was established in recognition of Dr. Meier's leadership in establishing the North Carolina Gamma Chapter in 1948 and his continuous service as chapter adviser until 1975. This award is given annually to the graduating Tau Beta Pi member who symbolizes best the distinguished scholarship and exemplary character required for membership. The name of the recipient is inscribed on a plaque displayed in the Engineering Building.

da Vinci Award. This award is presented by a faculty committee of the Department of Biomedical Engineering to the biomedical engineering senior with the most outstanding academic record. This award commemorates the contributions of Leonardo da Vinci in laying the foundations for the study of biomechanics.

von Helmholtz Award. This award is presented by a faculty committee of the Department of Biomedical Engineering to the biomedical engineering senior who has made the most outstanding contribution to the department. This award commemorates the work of von Helmholtz in laying the foundations of biomedical engineering.

Aubrey E. Palmer Award. This award, established in 1980, is presented annually by the faculty of the Department of Civil and Environmental Engineering to a civil engineering senior in recognition of outstanding academic achievement. The award consists of a certificate of recognition and the name of the recipient inscribed on a plaque displayed in the Engineering Building.

American Society of Heating, Refrigerating, and Air-Conditioning Engineers Outstanding Achievement Award. This award is presented annually by the Triangle Chapter of ASHRAE to two seniors in mechanical engineering. Selection is based on evidence of scholarly contribution in the HVAC field such as a distinctive project or outstanding term paper. The award consists of a United States savings bond presented to each student.

Aaronson Scholarship Award. Established by Dr. Pauline Gratz in memory of her husband, Sidney Aaronson, this award is presented annually to the graduating nursing student who, having been admitted to the Duke University School of Nursing as a freshman and having completed all requirements for the Bachelor of Science in Nursing degree at Duke University, holds the highest scholarship achievement in the graduating class on the basis of a cumulative quality point ratio. The award consists of a certificate of recognition and a cash award of \$100.

The Moseley Award. The Moseley Award of \$25 is given to the student in the senior class who holds the highest scholarship achievement in required nursing courses on the basis of cumulative grade point average. This award was created by an alumna, Matilda Holleman Moseley, and has been given annually for more than twenty years.

Outstanding Service Award. The Outstanding Service Award is presented to the student who has demonstrated outstanding service to the School of Nursing or to the community.

Thelma Ingles Scholarly Paper Award. This award is presented by the Beta Epsilon chapter of Sigma Theta Tau to an undergraduate nursing student who submits a formal paper related to nursing that is judged outstanding.

Education Records

Duke University adheres to a policy permitting students access to their education records and certain confidential financial information. Students may request review of any information which is contained in their education records and may, using appropriate procedures, challenge the content of these records. An explanation of the complete policy on education records may be obtained from the Registrar's office.

No information, except directory information (see below), contained in any student records is released to persons outside the University or to unauthorized persons on the campus, without the written consent of the student. It is the responsibility of the student to provide the Office of the Registrar and other University offices, as appropriate, with the necessary specific authorization and consent. For students in the School of Nursing, authorization forms are available in the Office of the Associate Dean.

Directory information includes name, addresses, telephone listing, date and place of birth, photograph, major field of study, participation in officially recognized activities and sports, weight and height of members of athletic teams, dates of attendance, degrees and awards received, and most recent previous educational institution attended. This information may be released to appear in public documents and may otherwise be disclosed without student consent unless a written request not to release this information is filed in the Office of the Registrar by the end of the second week of classes each term.

Special Programs



International Studies

A mosaic of programs in international studies has been fitted together over the past two decades with both teaching and research supported and coordinated by the University's Center for International Studies. The faculty, and others associated with the center, come from diverse disciplines and reflect a wide range of intellectual interests. Their common bond is concern with people, events, movements, and institutions outside the United States, as well as with relations among nations, and with those efforts in the United States which attempt to understand our roles in the world. They recognize the interdependence of this country's social, economic, and political well-being with that of the rest of the world. Such an understanding, and the awareness of relationships among peoples, events, cultures, movements, institutions, and processes is essential to a realization of the complexity of the world today and is properly the subject of primary emphasis in teaching and research in the University.

The programs of the Center for International Studies are concerned with international relations; global systems; studies in the Asian-Pacific area, Canada, Latin America, the Indian Ocean areas, Islamic and Arabian areas, and Russian and East European areas. Teaching and research are often comparative in approach, cutting across territorial boundaries or national institutions. On occasion the center focuses on a special problem of international significance, such as health care in developing countries. An interdisciplinary course on a contemporary issue is offered annually.

The Center for International Studies is administered by an advisory board composed of members of the faculty of several departments in the social sciences and the humanities. Professor A. K. Pye serves as the Director.

Accepting the premise that the world of the academy must have a global perspective, the University reaffirms its commitment to international studies in part through the undergraduate offerings in Trinity College of Arts and Sciences. These offerings include a major in Comparative Area Studies, a second major or a concentration in Canadian Studies, Islamic and Arabian studies, interdisciplinary courses, study of foreign languages, programs for study across the world, and programs to accommodate scholars and students coming to Duke from throughout the world. Some of these activities and programs are described below, and additional information on international studies is available from the Center for International Studies, 2122 Campus Drive, Durham, North Carolina 27706; (919) 684-2765.

COMPARATIVE AREA STUDIES

The major in comparative area studies provides for study of one or more regions of the world. The courses in the program are taught in a dozen cooperating departments. Interdisciplinary courses are also offered. The courses are listed and the major is described under Comparative Area Studies in the chapter "Courses of Instruction."

CANADIAN STUDIES

The Canadian Studies Program of courses introduces the student to various aspects of Canadian life and culture. The program's basic aim is to increase student knowledge and understanding of Canada over a widening range of disciplines. Extracurricular lectures by Canadian specialists on campus and from Canada and seminars devoted to Canadian topics are important features of the program. Consideration of Canadian problems and perspectives in other countries are encouraged. Concentrations in Canadian studies are described in the chapter "Courses of Instruction."

ISLAMIC AND ARABIAN DEVELOPMENT STUDIES

A program in Islamic and Arabian Development Studies was started in 1977 assisted by grants from the government of Saudi Arabia and several corporations in the United States. The program coordinates activities embracing some eighteen courses taught at Duke, including courses in Arabic. It provides financial support for outside lecturers in an interdisciplinary Islamic civilization course and a comprehensive survey course on contemporary Arab affairs offered in the political science department. The program embraces an outreach program which includes Belmont Abbey College, the College of Charleston, Converse College, Davidson College, Johnson C. Smith University, Old Dominion University, and the University of the South.

An international conference on problems of Saudi Arabian development was held in 1979 at Duke and a special summer program for college teachers in the Southeast was held in 1981. A second international conference on development of the Arabian peninsula was held at Kiawah Island in 1982. The program also supported a series of lectures in the continuing education program and the acquisition of materials for Perkins Library. The program supports several graduate fellowships and senior research appointments as well as the teaching of three years of Arabic. Each spring the program sponsors a senior/graduate seminar on comparative development problems in the Islamic world.

FOREIGN LANGUAGES

Students are encouraged to study foreign languages, including Arabic, Chinese, French, German, Greek, Hebrew, Hindi-Urdu, Italian, Japanese, Latin, Persian, Polish, Portuguese, Russian, Spanish, Swahili, and Yiddish. The course offerings are described in the chapter "Courses of Instruction." Recently renovated language laboratories provide up-to-date equipment for listening to and learning the spoken languages. Computer-assisted instruction is available for some languages; others may be learned by self-instructional programs augmented by native speakers serving as tutors.

STUDY ABROAD

Semester and Academic Year Programs

A Duke student may earn credit for approved work completed during the academic year at a foreign university or for an approved program abroad sponsored

by Duke or by another accredited American college or university in the fall, spring, and summer. To receive the maximum amount of study abroad transfer credit at Duke—four course credits for a full semester, eight for a full academic year, two for a summer—a student is expected to take a full, normal course load, as defined by the other accredited institution involved. No additional study abroad transfer credit will be awarded for a course overload. Ordinarily, work to be considered for transfer credit must be done in the language of the country in which the student takes the courses. A leave of absence from the University is granted for approved study abroad. Whenever possible, arrangements are made for students to register, while abroad, for the term in which they plan to return.

A student who wishes to receive transfer credit for study abroad should take into account the following criteria established by the faculty and administered by the Committee on Study Abroad:

1. a scholastic average of at least a B-;
2. certification, when applicable, from the foreign language department concerned, that the student has an adequate knowledge of the language of the country in which study is pursued;
3. approval, obtained before leaving Duke, of the appropriate Directors of Undergraduate Studies for the courses to be taken abroad, as well as approval of the program and the courses by the dean responsible for study abroad;
4. permission for leave of absence once program plans are complete.

Duke, at present, offers various programs in cooperation with other universities during the fall and spring terms. Students accepted may study in:

Austria. From time to time Duke sponsors a term program in Vienna for members of the Wind Symphony and other interested students. More information is available from Professor Paul Bryan, Department of Music.

Canada, Montreal. Duke students participating in the Duke/McGill University Exchange Program may spend one semester or academic year at McGill, located in the Quebec city of Montreal. Because the language of instruction at McGill is English, program applicants need not have studied French although some knowledge of it would be advantageous. The program is sponsored by the Canadian Studies Center and Trinity College; information and application forms are available in 116 Allen Building.

China. In cooperation with Nanjing University and the Beijing Teachers College, Duke conducts a six-month study program in the People's Republic of China in the summer and fall terms. The program includes a fall term at Nanjing University preceded by an intensive language session in Peking. Participants must have one year of Chinese language. Information is available from the Asian-Pacific Studies Institute, 2111 Campus Drive, and in 116 Allen Building.

England, Canterbury. Selected Duke students may enroll for their junior year at the University of Kent at Canterbury in this exchange program administered by Trinity College. More information is available in 116 Allen Building.

England. In the School of Nursing, the opportunity to study nursing in England is available to senior nursing students during the spring term. Information and applications are available from the Associate Dean of the School of Nursing.

Germany, Freiburg and Munich. Admission to these programs entails matriculation for an academic year at the University of Freiburg or the University of Munich. The student must, therefore, meet their admission standards. Courses are taken in German language, literature, art, and history through Wayne State University, while additional courses are taken at the German universities. More information is available from the Department of Germanic Languages and Literature.

India, Madras. Duke students may participate in a fall semester program administered by the consortium of the South Atlantic States Association for Asian

and African Studies, of which Duke is a member. The program offers courses in Indian history and culture, beginning Tamil, and independent research. More information may be obtained in 116 Allen Building.

Italy, Rome. As one of the participating members of the Intercollegiate Center for Classical Studies in Rome, Duke University nominates classics majors and other students with strong classical interests for admission to a term's work at the center, usually in the junior year. Instruction is offered in Greek, Latin, ancient history, ancient art, and archaeology. Some scholarship help is available. Additional information may be obtained from the Department of Classical Studies.

Japan, Tokyo. Two qualified students may be nominated each year by the East Asian Studies Committee for the junior year exchange program with International Christian University in Tokyo. Courses may be taken in English as well as Japanese. More information is available from the Asian-Pacific Studies Institute, 2111 Campus Drive, and 116 Allen Building.

Spain. From time to time Duke sponsors a term in Madrid. More information may be obtained from Professor Miguel Garci-Gómez, Department of Romance Languages.

Further information concerning semester and academic year programs, as well as the Oxford Summer Program (described below) and non-Duke summer programs, may be obtained in 116 Allen Building. All Trinity College students are responsible for following the procedures and meeting the deadlines set forth in Duke's study abroad booklet, *Opportunities for Undergraduate Study Abroad*, available there. In all cases, the dean of study abroad must be informed in advance about a student's plans.

Duke Summer Programs Abroad

Canada. The Montreal Program provides an immersion in French and in the culture and history of the Quebec area through classroom study, structured and spontaneous excursions, and daily interpersonal contact. The students are based at the Université de Montréal and are offered a three-week or six-week course, both of which begin in mid-May. For further information see Professor Marcel Tetel, Department of Romance Languages.

Chile. This program in Santiago is now being planned and is scheduled to be offered for the first time in 1983. It is designed for advanced undergraduate and graduate students. During eight weeks of study, participants will take three political science courses. While in Chile, they will live in the homes of local residents or university dormitories, giving them an opportunity to study Latin-American culture in depth. For further information see Professor Arturo Valenzuela, Department of Political Science.

England, Oxford. The Duke/Oxford Summer Program, a six-week session at New College, Oxford, utilizes the Oxford tutorial system of education. The tutorial format is supplemented by the lectures given at the University of Oxford International Graduate Summer School by noted British scholars. Detailed information may be obtained in 116 Allen Building.

France. The summer session office is planning a two-course, six-week program in Paris for the summer of 1983. The program is designed for both undergraduate and graduate students. Students will take Anthropology 123, The Anthropology of Mediterranean Europe, and a course in French civilization. They will live in a conveniently located dormitory. For further information see Professor Atwood Gaines, Department of Anthropology.

Germany. The summer session office offers two programs at the Friedrich-Alexander Universität at Erlangen, Germany. One program provides an opportunity to study classroom German at different levels while living with a German family and participating in study, day trips, and excursions (mid-May through late June). In the other program, advanced students may choose from a variety of FAU

courses and remain for a full summer semester (through early August). For further information see Professor Helga Bessent, Department of Germanic Languages.

Greece. The Department of Classical Studies offers a program in Greece. Through readings, walking lectures, and touring the important sites and museums students will study the development of the Pre-Classical, Classical, Roman, and Byzantine cultures in Greece. An immediate contact with the art, architecture, and archaeology will form the basis of the student's appreciation of our classical heritage. For further information see Professor John Younger, Department of Classical Studies.

Israel. The Department of Religion, the Cooperative Program of Judaic Studies of Duke University, the University of North Carolina at Chapel Hill, and the Duke summer session sponsor a summer semester program in Israel—in Jerusalem and Galilee. More information may be obtained from Professor Harry Partin, Department of Religion.

Italy. The Department of Classical Studies is planning a study program at Duke and in Italy in 1984. Through visits to sites and museums, walking lectures, and readings, the course will consider two themes: the gradual emergence of Rome as an urban culture, and the impact of other cultures upon the development of Rome. For further information see Professor Peter Burian, Department of Classical Studies.

Spain. The Duke in Spain Summer Program offers students a variety of on-site experiences and an opportunity to hear and speak Spanish in an ideal environment. Students will live with Spanish families in Madrid and will study Spanish culture, history, politics, literature, art, folklore, and religious beliefs. For further information see Professor Miguel Garci-Gómez, Department of Romance Languages.

Further information on Duke Summer Programs Abroad may be obtained from the Office of the Summer Session, 121 Allen Building.

FOREIGN STUDENTS AT DUKE

Increasing numbers of students from other countries are enrolling at Duke University. Currently, more than 300 students are engaged in undergraduate, graduate, and professional school programs. They represent sixty-nine countries from all parts of the world.

The International House at Duke University is the focal point for social and cultural programs planned especially for and by the foreign students. It is a meeting place for all internationals studying or working at the University.

The International House sponsors a number of programs and activities. The International Association, composed of American and foreign students, helps to foster mutual understanding among the students and staff and to encourage an exchange of ideas towards better international understanding. The Host Family Program offers all foreign students the opportunity to become acquainted with an American family. The International Wives Club provides a structure for the international women to meet with American women in an informal atmosphere. The Speakers' Bureau provides an opportunity for an international to share home culture and customs with members of the Durham community. English as a second language classes are held at the house twice a week. All the programs are available to all international visitors and provide opportunities for intercultural communication and a means for easy acculturation into the American society.

Judaic Studies

Established in 1973 and supported by Duke University and the University of North Carolina at Chapel Hill, the Cooperative Program in Judaic Studies provides the opportunity of studying Jewish civilization through a broad range of courses

including Hebrew language and literature, Yiddish language and literature, the archaeology of Palestine, and the history of Jewish religious thought. The program is administered by a joint planning council which also sponsors visiting speakers and professorships, library acquisitions, exchange programs with Israeli universities, summer school programs in Israel, and a publications program. The programs on the Duke campus are administered through the Duke Center for Judaic Studies. Students seeking further information on the program in Judaic studies should consult with Dr. Eric Meyers or Dr. Kalman Bland in the Department of Religion, 230 Gray Building.

Science, Technology, and Human Values

Participation in this program should enrich the professional understanding of the future scientist, physician, or engineer, and should broaden the appreciation of these activities for those who do not intend to pursue careers in these fields. Detailed information is given in the chapter "Courses of Instruction" in this bulletin.

Women's Studies

Women's Studies offers students the opportunity to enlarge and expand their understanding of themselves and the world around them through courses dealing with the experience of women and the social and cultural patterns between the sexes. A full description of this program is in the chapter "Courses of Instruction." For more information on Women's Studies, call the Office of Women's Studies, 119 East Duke Building, (919) 684-5683.

Twentieth-Century America Program

The Twentieth-Century America Program explores modern American society in a group of interrelated courses from the perspectives of history, literature, sociology, religion, and political thought. The program offers five courses in the fall, of which participants must take at least three. Some twenty-five students are selected for the program; all undergraduates may apply.

This special program provides the student with the opportunities that come from relatively small classes (often of seminar format), a program of interrelated and mutually reinforcing courses, and close relationships with professors and stimulating fellow students.

Courses that the program has offered include English 1 (special section), History 92, Sociology 101, Political Science 144S, and Religion 60 (see descriptions in this bulletin). Further information and application forms may be obtained from the Director of the program who can be reached through the Premajor Advising Center.

Ethics and the Professions

This summer program, designed for preprofessional students and others interested in the ethical problems of the professions in society, consists of two courses to be taken concurrently during the first summer term. The first course, Religion 166, is a series of lectures on moral traditions, ethical theories, professional ethics, and the professions in society. The second course, Philosophy 167S, consists of discussion classes on business ethics, legal ethics, medical ethics, and technological ethics. Guest lectures and discussions are presented by members of the Duke business, law, medical, and engineering school faculties and by practicing members of these professions. Further information may be obtained from Dr. Thomas E. McCollough, Department of Religion.

Living-Learning Program on Race and Society

The Race and Society Program brings together a varied cross-cultural group of fifteen to twenty-five undergraduates to explore questions of race, ethnicity, and social diversity through a coordinated interdisciplinary curriculum. The program offers half a dozen courses in the fall, of which participants must take at least three. (Related courses during spring term are optional.) Students live together in the same dormitory with their own resident adviser for the full year.

This special program provides interrelated course work, close contact with faculty, and a variety of extracurricular activities. All undergraduates may apply, and incoming freshmen are welcome. For courses offered, see the descriptions under Anthropology 94, English 1 and 26S, History 165S, and Religion 136. Further course listings or additional information may be obtained through the Premajor Advising Center.

Institute of the Arts

The Institute of the Arts coordinates activities in the performing and creative arts, thus encouraging the interrelationship of programs in drama, dance, studio art, imaginative writing, musical performance and composition, and film, and allowing the creation of new interdisciplinary courses and special events. A full description of this program is in the chapter "Courses of Instruction." Students seeking further information on the Institute of the Arts should consult Professor James Applewhite, Director, 120 East Duke Building, 684-6654.

Duke University Marine Laboratory

The Duke University Marine Laboratory (DUML) is located adjacent to the historic seacoast town of Beaufort, North Carolina, with direct access to the Atlantic Ocean, Cape Lookout National Seashore Park and the Outer Banks, various tributaries, sand beaches and dunes, maritime marshlands, and coastal forests. Because of the richness and diversity of its flora and fauna, the area provides an excellent opportunity for marine biological study. The Marine Laboratory is an interdepartmental teaching and research facility of the University. The departments which are chiefly concerned are biochemistry, botany, chemistry, geology, physiology, and zoology. Academic programs include a spring term and a fall term for undergraduates and three terms of summer school for undergraduate and graduate students as well as a cooperative academic program for students from several colleges and universities. For information concerning application and registration, write to Admissions Office, Duke University Marine Laboratory, Beaufort, North Carolina 28516.

Agreements with Other Universities

Neighboring Universities. Under a plan of cooperation, the interinstitutional agreement among Duke University and the University of North Carolina at Chapel Hill, North Carolina State University at Raleigh, and North Carolina Central University in Durham, a student regularly enrolled in Duke University and paying full fees may enroll for one approved course each semester at one of the institutions in the cooperative program. If the student takes two or more courses during a summer at Duke, one of the courses may be taken at one of the neighboring institutions under this plan. This agreement does not apply to contract programs such as the American Dance Festival.

Approval forms for courses to be taken at these neighboring institutions may be obtained from the offices of the academic deans at Duke. Ordinarily, only those

courses not offered at Duke will be approved. Credit so earned is not defined as transfer credit since grades in courses taken under the interinstitutional agreement are entered on the official record and used in determining the quality point ratio. The student pays any special fees required of students at the host institution and provides transportation.

Howard University. Duke students participating in the Duke/Howard University Exchange Program may spend a semester studying at Howard University in Washington, DC, while Howard undergraduates enroll for the same period at Duke. More information about this program, administered by Trinity College, is available in 116 Allen Building.

Continuing Education

Academic Study. Local adult residents are encouraged to pursue academic study at Duke (1) as provisional degree candidates for those resuming or beginning a bachelor's degree; (2) as nondegree students, for those seeking a sequence of undergraduate credit courses; and (3) as students completing the last year of work towards a degree at another institution. These students are given academic and career counseling by the Office of Continuing Education. They are subject to most of the regulations set forth for degree candidates. Continuing education applications may be obtained from the Office of Undergraduate Admissions and must be returned to that office, accompanied by a \$35 application fee, by August 1 for the fall semester and by December 1 for the spring semester.

Adult Counseling Services. Adult Counseling Services assists persons making decisions about returning to work, re-entering school, career planning and assessment, life/work transitions, and individual goal setting. Individual appointments, group sessions, and workshops are held.

Short Courses and Conferences. Short courses (noncredit) in the liberal arts are offered regularly throughout the year for those interested in building personal skills and career advancement.

Conferences, institutes, and training programs are conducted during the academic year and in the summer. Some are residential and others are designed for local participants. Some carry academic credit, others award continuing education units and certificates, and still others are noncredit. Contact Marilyn Hartman in the Office of Continuing Education, 107 Bivins Building, for brochures describing current offerings and for assistance in developing programs.

The Institute for Learning in Retirement. The institute is for persons over fifty years of age who recognize in themselves a need to continue learning and sharing knowledge. For brochures on each program and for fuller information, contact the Office of Continuing Education, 107 Bivins Building.

Reserve Officer Training Corps

The Naval Reserve Officer Training Corps (NROTC). The Department of Naval Service provides students an opportunity to become naval officers upon graduation. Through two basic programs, the Scholarship Program and the College Program, commissions are offered in the regular and reserve components of the U.S. Navy and the U.S. Marine Corps, respectively.

Students participating in the Scholarship Program are selected on the basis of an annual nationwide test. Those selected are appointed midshipmen, U.S. Naval Reserve, by the Secretary of the Navy, and granted the compensations and benefits authorized by law for a period not to exceed four years of undergraduate study. During these years of college training, the Navy provides tuition, fees, uniforms,



and textbooks. In addition, students receive subsistence pay and summer active duty pay of approximately \$1,300 each year. Scholarship Program participants are encouraged to pursue majors in engineering or in specific science fields, although a major in any field of study leading to a bachelor's degree meets the basic requirement. Students participate in training courses each summer either aboard ship or at naval shore facilities to augment their academic studies. The summer training includes surface, submarine, aviation, and amphibious indoctrination. Upon graduation, students receive appointments as Ensigns in the Navy, or as Second Lieutenants in the Marine Corps, after which they serve as required by the Secretary of the Navy in the same manner as Naval Academy graduates. The minimum period of active duty service is four years for regular officers.

College Program students may apply to the NROTC at any time during the academic year. They take the same courses and wear the same uniforms but attend the University at their own expense. College Program students receive government-furnished uniforms and all books required for naval science courses. They have the status of civilians who have entered into a mutual contract with the Navy. During the last two academic years, they enlist in a component of the Naval Reserve, receive \$100 per month subsistence pay, and participate in summer cruise training. Upon graduation students receive commissions as Ensigns in the Naval Reserve or as Second Lieutenants in the Marine Corps Reserve and are ordered to active duty for three years.

No distinction is made between students in the two programs in the NROTC unit. College Program students may gain scholarship status through performance, competition, and nomination by the Professor of Naval Science. If selected they will receive the attendant benefits and pay. Students in either program may elect the Marine Corps option, thereby qualifying for a commission in the Marine Corps.

The academic program for an approved degree and commission for Scholarship and College Program students must include all naval science courses, laboratories, and seminars. Scholarship students must complete one year of calculus by the end of the sophomore year, one year of calculus-based physics by the end of the junior year, and one semester of a modern foreign language. College Program students are encouraged, but not required, to take calculus and physics. Completion of calculus and physics will be considered in decisions made by the Professor of Naval Science for Navy scholarship applicants. Technical electives are required to ensure that the student obtains some familiarity with the sciences. Marine Corps students may substitute management and political science courses for the calculus and physics requirement.

The Air Force Reserve Officers Training Corps (AFROTC). This unit functions as the Department of Aerospace Studies. It selects, trains, and commissions college men and women who desire to serve in the U.S. Air Force. Two AFROTC programs exist, a four-year and a two-year program.

The four-year program consists of two segments: the General Military Course, which covers the freshman and sophomore years; and the Professional Officer Course, which covers the junior and senior years. These two segments are linked by a four-week summer field training encampment at selected Air Force bases. Entry into the four-year program is open to freshmen and to sophomores who are willing to make up the course work missed as a result of late entry into the program. Students entering the program as sophomores take both the freshman and sophomore courses in one year.

Applications for the two-year program should be submitted not later than the spring semester of the sophomore year. Following their sophomore year, candidates attend a six-week field-training encampment which concentrates on the course work missed during the freshman and sophomore years.

Cadets may compete for a scholarship if they desire: freshmen, not previously awarded a four-year scholarship, for a three and one-half year scholarship to begin during the second term of the freshman year or for a three-year scholarship to begin with the sophomore year; and sophomores, for a two-year scholarship to begin with the junior year. Candidates for the two-year program may compete for a scholarship during the six-week summer encampment. Scholarships provide full tuition, the cost of all required books, certain fees, and a stipend of \$100 per month. Scholarships are available in pilot, navigator, missile launch, technical, prehealth, nurse, and nontechnical areas. All cadets, whether they hold scholarships or not, receive a tax-free stipend of \$100 per month (limited to \$2,000) during their junior and senior years.

Entry into the professional officer segment of the AFROTC program entails four years of active duty and two years of inactive reserve duty. For details on entrance and commissioning requirements, direct inquiries to the Department of Aerospace Studies.

The Army Reserve Officer Training Corps (Army ROTC). The Department of Military Science at Duke University provides the student an opportunity to earn a commission as a Second Lieutenant in the Army while completing the requirements for a baccalaureate degree. Commensurate with the desires of the student, this commission can be either for service in the Army Reserve, National Guard, or active duty.

The Army ROTC program is made up of a two-year basic course (freshman and sophomore level) which is taken without obligation and a two-year advanced course (junior and senior level) which includes six weeks of advanced summer camp, usually completed immediately prior to the senior year. Direct entry into the advanced course is permitted for students who have previous military training or experience, or who complete a six-week basic summer camp at Fort Knox, Kentucky. To be eligible for participation in the advanced course, students must successfully complete the basic course (unless direct entry is permitted), be physically qualified, be of good moral character, have a minimum of two years remaining as a full-time student (undergraduate or graduate level), and sign a contract to accept a commission in the Army.

University students may enroll in individual military science courses without incurring a commitment to the Army. Full academic credit is awarded upon successful completion of the courses and the credit earned may be used to fulfill the appropriate elective requirement of the student's own major field of study. All military texts and equipment required are provided without cost to the student.

Cadets become eligible for commissioning upon completion of the Army ROTC program. In those cases where such completion predates graduation from the University, the cadet may accept a reserve commission and participate with pay in Army Reserve or National Guard training until he or she graduates. The option to accept a commission on active duty may then be exercised when the cadet completes the requirements for an academic degree. Qualified Army ROTC commissionees who desire graduate school prior to entering active duty may delay their service in order to obtain advanced academic degrees. Further, fully funded Army fellowships for graduate study are available on a competitive basis. These grants, which allow up to two years of study, provide full salary and allowances for the commissionee and, in addition, pay the costs associated with the advanced degree program.

Military science students are encouraged to compete for Army ROTC scholarships which pay tuition, fees, and textbook/equipment costs in addition to providing a tax-free monthly stipend of \$100 for the balance of the normal period to graduation. All nonscholarship cadets enrolled in the advanced course receive the monthly stipend as well. Students are additionally paid while engaged in summer camp training. Those who elect to participate throughout the academic

year with reserve forces units under a simultaneous membership program (i.e., serving both in ROTC and with a local Army Reserve or National Guard Unit) are also paid by their reserve component commands.

Precollege Program

During the summer of 1983, Duke University will offer a Term II program for rising high school seniors from across the country. The Precollege Program is designed to provide the high academic challenge of college level courses to qualified college-bound students and to help prepare them for the adjustments they will be making when they enter college as freshmen. Introductory level courses in the humanities, social sciences, natural sciences, and engineering will be offered for credit and there will be a wide range of campus programs and activities available as well. The students will live in supervised, air-conditioned University dormitories, eat their meals in the University dining halls, enjoy the opportunity of studying with distinguished members of the Duke faculty, and will have access to all University libraries and athletic facilities. Special programs organized by the residential staff will include sessions on such topics as research and study skills, self-identity and interpersonal relationship problem solving, health and physical fitness, and selection of careers and colleges. For further information, contact the Precollege Program, 01 West Duke Building, Duke University, Durham, North Carolina 27708.

Duke Summer Festival of Creative Arts—Artsfare '83

The Duke Summer Festival of Creative Arts is part of the summer session and an extension of the function of the Office of Cultural Affairs, coordinating the arts in the summer and providing an exciting, artistically stimulating environment for the campus and community. During the summer, it is possible to offer new and innovative courses and workshops. Distinguished artists and scholars will be involved in class and cocurricular sessions. Students will have the opportunity to try their wings in formal and informal productions.

Specific course listings can be found under drama, music, and dance. The range of fees and other information may be obtained by writing Summer Session, Duke University, Durham, North Carolina 27706.

Summer Drama Program. The Duke University Drama Program, which began its course offerings in the summer of 1974, strives to make its summer program particularly exciting and innovative. The course offerings, listed in this bulletin under drama, and the production program of Summer Theatre at Duke offer the theater-oriented student an integrated program of training in practical theater and dramatic literature during the first and second summer terms.

Detailed information on faculty, courses, productions, and auditions may be obtained by writing to Summer Drama Program, Duke University, Box 6936 College Station, Durham, North Carolina 27708.

Summer Theatre at Duke. Founded in 1972, Summer Theatre at Duke has become an eagerly awaited series of exciting theatrical events. The repertory is chosen from the best in modern theater and musical comedy with an occasional new look at a classic. The casts are selected on the basis of auditions held during late spring. Four professional guest artists will headline casts of students and local talent. Direction and design are provided by the professional staff of the Duke University Drama Program.

For its twelfth season, Summer Theatre at Duke will offer four major productions and several special events during June and July, 1983. The repertory and ticket information will be announced in late spring. For further information,

write to Summer Theatre, Duke University, Box 6936 College Station, Durham, North Carolina 27708.

The American Dance Festival. The six-week program offers a wide variety of classes, performances, and workshops. For information, write to the American Dance Festival, Duke University, Box 6097 College Station, Durham, North Carolina 27708.

Campus Life and Activities



Residential Life

Duke has a long tradition as a residential university and has sought to provide convenient housing for the majority of the undergraduate students. While the University was established to provide a formal educational opportunity for students, Duke has always taken the position that education encompasses social and personal development as well as intellectual growth. In order to facilitate such a holistic approach, Duke seeks to provide a supportive environment substantially anchored in its residential program.

While freshmen are required to live in the University residence halls, a number of upperclassmen choose to live off campus. Students enrolled beyond their fourth year of the undergraduate program cannot be granted space in University housing. Transfer students, part-time students, and former students who have been readmitted are not eligible for on-campus housing.

Residence Halls and Apartments. The University accommodates 88 percent of its undergraduates in fifty-eight residence hall living groups located on East, West, and North Campuses and in apartments located on Central Campus. University housing is considered to include residence hall space as well as Central Campus Apartments. Placement in any of these areas fulfills the University's obligation to house students in University housing.

Freshmen reside in all-freshman houses clustered on the three campuses; upperclass students reside not only in all-upperclass residence halls but also in Central Campus Apartments. Residential fraternities are housed in sections of upperclass residence halls; by tradition, sororities are not residential. Freshman housing assignments are made by lottery to the houses in the freshman clusters while upperclass housing assignments are made by a combination of lottery and student choice.

Living groups elect officers and organize social, intramural, and cocurricular programs, and community service projects. All of the residence halls have resident advisers who live in the houses and are members of the staff of the Dean for Residential Life. These graduate and undergraduate students have broad responsibilities in the residential life of the University including counseling students with personal problems, advising the house governments, and serving as resource persons for students.

Residence Hall Programming. Academic, cultural, and cocurricular programming is planned and presented throughout the year in the residence halls through the cooperative work of the Office for Residential Life, Trinity College of Arts and Sciences, the School of Engineering, and resident students. There are

several faculty members in residence in both freshman and upperclass houses. Faculty offices and seminar rooms are also located in several of the freshman houses. The goals of these various residential programs are to enhance the quality of intellectual and social life for the residents on campus, to facilitate student-faculty interaction outside of the formal classroom, and to develop a greater sense of community within the individual residence halls as well as within the greater University.

Living Off Campus. The option of living off campus is available for upperclass students; however, those who choose this option lose their resident status and are no longer eligible for University housing.

Dining Facilities

All students living in campus residence halls are required to participate in a point plan which has five options available. Off-campus students may elect to participate in any of these plans or a special off-campus offering. The Duke Point Plans offer students the flexibility of using their points in most of the cash a la carte operations as well as in the operations where unlimited seconds are served and where there is a great variety of food available.

Because of the large number of students using food services, it is difficult to provide individualized, specialized diets; they are provided for, however, after personal consultation with a registered dietitian. Students requiring special diets should consult Food Services, Office of Nutrition Services.

Duke University Food Services (DUFS) operates several facilities for student use. On East Campus there is the East Union, an unlimited-seconds cafeteria, and the Down Under (located in Gilbert-Addoms dormitory), an afternoon and late night a la carte food service. The dining facilities on West Campus include two cafeterias with multiple-choice menus; the Oak Room, a full-service dining room where meals and a la carte items are served at the table; the Cambridge Inn, a deli and snack bar, which is open throughout the day and evening. In the new Bryan University Center are a snack bar and rathskeller. On the North Campus, Trent Drive Hall has a cafeteria; the Sprout, a soup and salad bar; and Gradel's, a snack bar/delicatessen, which is open until midnight. In addition, DUFS operates Pizza Devil, a to-your-door pizza delivery service, and a full range of catering services available to all students.

Religious Life

Two symbols indicate the importance of the religious dimension for Duke University: *Eruditio et Religio*, the motto emblazoned on the seal of the University, and the location of the Duke Chapel at the center of the campus. People from all segments of the University and the surrounding community come together in Duke Chapel on Sunday morning to worship in a service which offers excellence in liturgy, music, and preaching. The University ministers work with the chaplains and staff persons from the Roman Catholic, Protestant, and Jewish communities, and with other groups to provide a ministry which is responsive to the plurality of University religious interests. The traditional modes of ministry (pastoral, priestly, and prophetic inquiry) are offered in traditional and contemporary forms.

Students and others in the University have opportunities through the religious life of the University to search for meaning, to ask the ultimate questions, to worship in small communities, to meditate, to participate in contemporary liturgies, to learn from outstanding thinkers in the religious traditions, and to work to bring about a more just and humane society.

Services Available

Offices in Each College and School. In Trinity College of Arts and Sciences, in the School of Engineering, and in the School of Nursing, deans, faculty members, and counselors are readily available to discuss various concerns with students and to assist them in matters relating to courses, majors, careers, cocurricular activities, and residential life. Each college and school has its own academic deans and advisers. In Trinity College of Arts and Sciences, there are academic deans for upperclass students, according to the student's declared major, as well as one for premajor students (freshmen and some first semester sophomores). In the School of Engineering and the School of Nursing, in addition to academic deans, each student is assigned an academic adviser for the freshman and each succeeding year.

The School of Nursing has its own Dean of Student Affairs, whereas the Office of the Vice-President for Student Affairs has jurisdiction over students in Trinity College of Arts and Sciences and the School of Engineering. The Office of Minority Affairs relates to the needs of all minority students at Duke.

Student Health Service. The objective of the Student Health Service is to provide medical care and advice to students. Both the Student Health Services Clinic and the University Infirmary are available to students for that purpose. A separate fee for this service is assessed.

The facilities of the Student Health Clinic are open during both regular and summer sessions to all currently enrolled full-time undergraduate students, as well as to regularly enrolled students in the graduate and professional schools. For treatment of illnesses or injuries, students should first visit the Student Health Clinic. The campus bus makes regular trips to the clinic, and emergency transportation can be obtained from the Duke public safety officers or from ambulance services in Durham. Residential staff personnel should be consulted, whenever possible, for assistance in obtaining emergency treatment. For a description of the specific services provided by the clinic and also by the infirmary, see the *Bulletin of Duke University: Information and Regulations*.

In addition to the Student Health Service, the University makes available a plan of accident and sickness insurance to cover students who are enrolled in the University. This plan is designed to complement services normally not accessible to students through the Student Health Service coverage; it covers students both on and off campus, at home, or while traveling between home and school during the interim vacation periods throughout the one-year term of the policy.

All full-time and part-time degree candidates are required to enroll in the student accident and sickness insurance policy, made available by the University, unless they show evidence by completing the appropriate waiver statement contained on the remittance form of the University invoice indicating that they are covered by other generally comparable insurance. This statement requires that the name of the insurance company and the policy number be indicated as well as the signature of the student or parent. Also, this requirement may be waived by signing the appropriate space on the University invoice indicating a willingness to assume the medical costs of any sickness or accident.

Counseling and Psychological Services. Counseling and Psychological Services (CAPS) is a component of student services which provides a coordinated, comprehensive range of counseling and developmental services to assist and promote the personal growth of Duke students. The professional staff is composed of psychologists, clinical social workers, and psychiatrists experienced in working with young adults. They provide evaluation and brief counseling/psychotherapy regarding a wide range of concerns, including such issues as self-esteem and identity, family relationships, academic performance, dating, intimacy, and sexual

concerns. While students' visits with counselors are usually by appointment, a walk-in consultation service is provided two hours each weekday for students with urgent personal concerns.

Each year CAPS offers a series of self-development seminars focusing on skills development and special interests. These explore such interests as stress management, assertiveness training, career planning, couples' communication, and study skills. Interested students may call or come by CAPS for further information.

As Duke's center for administration of national testing programs, CAPS also offers a wide variety of graduate/professional school admission tests and professional licensure and certification examinations. The staff is also available to the entire University community for consultation and educational activities in student development and mental health issues affecting not only individual students but the campus community as a whole. They work with campus personnel, including administrators, faculty, student health staff, religious life staff, resident advisers, and student groups, in meeting needs identified through such liaisons. Staff members are available to lead workshops and discussion groups on topics of interest to students.

CAPS maintains a policy of *strict confidentiality* concerning information about each student's contact with the CAPS staff. If a student desires that information be released to anyone, written authorization must be given by the student for such release.

There are no charges for initial evaluation, brief counseling/psychotherapy, or self-development seminars. If appropriate, referral may be made to other staff members or a wide variety of local resources.

Appointments may be made by calling 684-5100 or coming by the office in 214 Old Chemistry Building, West Campus, between 8:00 A.M. and 5:00 P.M. Monday through Friday. If a student's concern needs immediate attention, that should be made known to the secretary; every effort will be made to arrange for the student to talk with a staff member at the earliest possible time.

Office of Placement Services. The Office of Placement Services is the liaison between the University community and potential employers in business, education, nonprofit organizations, and government. The purposes of the office are to give Duke students opportunities to investigate career options prior to beginning the placement process and to assist seniors in identifying employment opportunities commensurate with their qualifications, interests, and desires. An extensive file of openings for permanent, part-time, and summer employment is available, as is a library of general information about careers, employers, and graduate schools. Staff members are available to discuss career plans; permanent, summer, and part-time employment opportunities; interviewing techniques; and other related matters.

Students who are nearing the completion of a degree and are interested in interviews with representatives from business and industry, government agencies, and graduate and professional schools should visit the office in September. Employer and graduate and professional school representatives visit Duke beginning October 1.

Part-time Employment. A listing of a wide variety of part-time job opportunities on campus and in the Durham area is maintained in the office. All students interested in working during the school year should register at the beginning of the semester. Every effort will be made to help students find a job consistent with their career interests.

Summer Employment. A file of contacts for summer employment is maintained in the office, and some representatives conduct interviews on campus for these positions. Students interested in summer jobs should contact the office in early October.

Career Counseling. Preliminary exploration of career interests early in the student's academic career is possible through the Career Apprenticeship Program, which offers nonpaid experience in a variety of career fields. This program gives the student the opportunity to gain practical work experience and to broaden the educational experience by related field work during the undergraduate years. Students may use the Duke Network file to identify Duke alumni, representing a variety of career fields, who have agreed to talk with undergraduates about their career paths.

Office of Minority Affairs. The Office of Minority Affairs (OMA) is an interdisciplinary/student service component of the University which assists minority students in their adjustment to student life. The office has designed and implemented a variety of programs which are aimed at maximizing students' potential for realizing their academic goals. Three major program components are included in these efforts:

Summer Transitional Program (STP). This program introduces precollege students to academic and student life at Duke. Courses in English, mathematics, and study skills are offered to incoming freshman students during the summer preceding matriculation. Individual, group, and peer counseling sessions in STP present students with the opportunity to exchange ideas regarding individual and group concerns. STP students are housed together on West Campus.

Counseling in Academic and Social Affairs (CASA). CASA provides the ongoing leadership of a graduate counselor to each undergraduate student. The counselors visit with students on a regular basis, hold group discussions, and serve as sources of information and referral to all students.

Tutoring Program. This program maintains tutors in mathematics and chemistry on a regular basis for any student seeking assistance. Although many students come to the tutoring program through supportive academic personnel, most are self-referred. Tutoring is encouraged and should be arranged as soon as a need is perceived.

Students at the University are invited to make use of the services of the Office of Minority Affairs.

Offices for Program Planning

The University Union (Bryan University Center). Opened in the spring semester of 1982, the Bryan University Center, an architecturally compatible addition to the West Campus, is the hub of cultural, social, recreational, cocurricular, and service activities for students and other segments of the campus community. The University Union, housed in the Bryan Center, brings all campus segments together through a broad program of lectures, concerts, performing arts, exhibits, games, festivals, crafts, special events, dances, and film and video presentations and productions. Other union activities range from facilities management to general information services.

Other sections of the Bryan Center house the University stores, a rathskeller, a snack bar, three first-rate theaters, a post office, bank services, an art gallery, meeting rooms, offices for student organizations, an information center, a ballroom, a crafts center, a games room, a mall, and lounges. Similar services are provided on East Campus by the union.

The Office of Student Life. The Office of Student Life develops and coordinates the new student orientation programs for freshmen and transfer students and works closely with the Freshman Advisory Council (FAC), which is composed of upperclass men and women who are selected for qualities of responsibility and leadership. Members of FAC are assigned small groups of freshmen and during orientation week, they welcome their groups of new students

and introduce them to the University. The office also works with entering transfer students and the Transfer Advisory Committee.

Other responsibilities of this office include coordinating the application of the general rules and regulations of the University, advising the participants in the judicial process, serving as a resource center for handicapped students, advising Interfraternity and Panhellenic Councils, and acting as a liaison with both the Student Health Service and the Department of Public Safety.

The Office of Student Activities. Located in the Bryan University Center, this office coordinates and advises those undergraduate group activities and clubs which are not directly associated with an individual college or school. The office serves as a liaison between the University administration, campus groups, clubs, and organizations.

The financial manager in this office works with the accounts of all student organizations chartered by the student government, Associated Students of Duke University (ASDU), the accounts of residential groups, and the treasurer of the University Union. This office provides a congenial atmosphere for club work, making available at no cost telephones, typewriters, table space, and publicity supplies. In addition, the Office of Student Activities has information about reservation policies, film showings, office space, and funding sources on campus.

Office of Cultural Affairs. The Office of Cultural Affairs is responsible for the creation, coordination, and implementation of many of the cultural and popular programs which occur on campus. The office is directly responsible for the Duke Artists Series, Quadrangle Pictures (35mm film program), the Triangle Dance Guild at Duke Series (cosponsored with the Duke University Union's Performing Arts Committee), Artsfare, The Summer Festival of Creative Arts, and the scheduling of Page Auditorium, as well as all campus activities. With the exception of athletic events, all campus entertainment programs which require tickets are handled by Page Box Office, an extension of the Office of Cultural Affairs. In addition to overseeing arts-related activities, this office is responsible for publishing and distributing the yearly and weekly editions of the *Duke University Calendar*.

The International House. See the section on foreign students in the chapter "Special Programs."

Student Activities

Associated Students of Duke University. The Associated Students of Duke University (ASDU) is responsible for articulating undergraduate student thought and opinion on University-wide matters and for working toward constructive changes in the educational process and University environment. The working philosophy of ASDU is that students have the right to participate in the process for making decisions which primarily affect students.

The Executive Committee is the coordinating body of all ASDU functions. It consists of the President, four Vice-Presidents (one each from the School of Engineering, the School of Nursing, and Trinity College, and one at large), an Executive Secretary, an Administrative Secretary, and members appointed by the President.

The ASDU legislature is composed of representatives of each of the undergraduate living groups on campus, representatives of students living off campus, and representatives of those students residing in Central Campus Apartments. There are also several at-large legislators. It fulfills a primarily administrative role in chartering student organizations and regulating student elections and certain aspects of conduct. As the representative body of the student government, it registers student opinion and directs action in selected areas

through legislation. A budget commission (Student Organizations Commission) allocates all student fees to various student organizations. Various committees of ASDU, such as those concerned with athletic affairs, external affairs, academic affairs, and University services available to students (internal affairs), undertake projects for the direct benefit of the student body. Some ASDU services include a legal assistance program, an off-campus housing locator, a typing file, a bail loan fund, a maternity and abortion loan fund, a student concern center, a ride/rider service, and a student check-cashing service.

Cultural and Social Organizations. The scope of the more than 100 student organizations is suggested by a partial listing of their names: Alpha Phi Omega service fraternity, Black Student Alliance, Baptist Student Union, Cheerleaders, International Club, Duke Ice Hockey, Outing Club, Sailing Club, Association of Duke Women, Photography Group, and the N.C. Public Interest Research Group. Nineteen national social fraternities and thirteen national sororities are represented on campus. They are governed by the Interfraternity and Panhellenic Councils, respectively.

Many opportunities are provided on campus in the areas of music and drama. The Chorale, Modern Black Mass Choir, Chapel Choir, Wind Symphony, Marching Band, Symphony Orchestra, and Collegium Musicum are examples of musical organizations. Duke Players perform established and experimental drama; Hoof 'n' Horn presents musical comedy; Karamu performs drama related to the black experience.

Several academic departments sponsor organizations and programs for students with special academic or professional interests. There are over twenty majors unions on campus. There are also academic and leadership honorary societies.

Media. The *Duke Chronicle*, the campus newspaper, publishes five issues weekly and is governed by the newly created Chronicle Board. A humor magazine (*Jabberwocky*), a literary magazine (the *Archive*), and a feature magazine (*Tobacco Road*) are published on a regular basis by students. In addition, a *Teacher-Course Evaluation Book* and a comprehensive yearbook, the *Chanticleer*, are produced each year. These publications are under the direction of the Publications Board, which chooses the editors and business managers and reviews and approves the financial budgets of all such franchised publications. WDUK-AM is the student-managed and programmed radio station, broadcasting to the Duke community. Duke Union Community Television (Cable 13) is operated by students and produces color television programs that are broadcast throughout the campus on the University cable system. The *Duke Engineer*, the official student magazine of the School of Engineering, appears twice each year and contains articles on technical and semitechnical topics as well as other matters of interest to the school. The *Charge*, the undergraduate student handbook of the School of Nursing, is published annually by the students and contains information and regulations of interest to the students in the School of Nursing.

Project WILD. Project WILD (Wilderness Initiatives for Learning at Duke) is a unique student organization which, through the ideal of experiential education—learning through doing—tries to ease the transition period into college for Duke freshmen. Run totally by students, the program strives to teach self-worth, group awareness, and an appreciation of nature. WILD, a twelve-to fifteen-day course held prior to Orientation Week, runs both biking and backpacking crews through the North Carolina mountains. In addition to this August course, WILD also sponsors activities including weekend trips, house courses, both a Christmas and May wilderness course, and New Games festivals for all students.

Recreational Activities and Intramural Sports. The Duke recreational and intramural programs provide all students with opportunities to participate in some

form of healthful, informal, and competitive physical activity. In a typical year more than 3,000 students compete for many intramural titles and trophies. Each year Duke, the University of North Carolina, North Carolina State, and Wake Forest meet in the annual Big Four Intramural Day.

The men's and women's intramural programs include many different activities (e.g., bowling, cross-country, golf, handball, horseshoes, tennis, flag football, badminton, racquetball, basketball, swimming, table tennis, volleyball, soccer, softball, and track). In addition, special events in other areas of interest are held. Various performing clubs, including one for water ballet, offer the student opportunities to take part in extracurricular activities. Through coeducational intramurals, the student is encouraged to participate on a less competitive level, promoting relaxed social and physical activity. Opportunities for competition between men and women are provided in areas that include archery, badminton, basketball, softball, racquetball, squash, table tennis, tennis, volleyball, and water polo.

The program in recreation is designed to offer challenging opportunities for students to meet their physical and other needs through worthy leisure-time pursuits. The University's varied athletic and recreational facilities and equipment are available for use by students. The facilities for recreation include a golf course, lighted and unlighted tennis courts, two swimming pools, squash and racquetball courts, three gymnasiums, a weight training room, outdoor handball and basketball courts, an archery range, horseshoe courts, an all-weather track, numerous playing fields, jogging and exercise tracks, and informal recreational areas. Tournaments in the recreation sports are often organized and conducted by students. More than thirty sports clubs exist to provide opportunities for students with similar interests to participate in sports or recreational activities. Clubs dealing with gymnastics, scuba diving, sailing, cycling, crew, riding, fencing, football, frisbee, ice hockey, kayaking, lacrosse, archery, volleyball, badminton, karate, rugby, soccer, and other activities are available to interested students.

Intercollegiate Athletics. The Athletic Department fosters intercollegiate athletics by striving for excellence and by providing the best possible framework within which highly accomplished student athletes can compete. The department has a dual responsibility to provide a high-quality athletic program and environment so that all students have the opportunity to compete to the fullest extent of their abilities. Duke is a member of the National Collegiate Athletic Association and the Atlantic Coast Conference (ACC). The ACC consists of Clemson, Duke, Georgia Tech, Maryland, North Carolina at Chapel Hill, North Carolina State, Virginia, and Wake Forest.

The intercollegiate program for men includes football, cross-country, soccer, basketball, swimming, fencing, wrestling, indoor and outdoor track, baseball, golf, tennis, and lacrosse. The women's athletic program provides intercollegiate competition in basketball, fencing, field hockey, golf, gymnastics, swimming, tennis, and volleyball. Freshmen may participate on all varsity teams.

The Director of Athletics and the Associate and Assistant Directors of Athletics provide departmental leadership and coordinate all athletic policies with the University Athletic Council. The council consists of representatives from the undergraduate student body, the faculty, the administrative staff, the trustees, and the alumni. The council meets with the Director of Athletics periodically during the school year. The Chairman of the council is the official University representative at national and conference athletic meetings.

Judicial System and Regulations

Duke University expects and requires of all its students full cooperation in developing and maintaining high standards of scholarship and conduct. Each

student is subject to the rules and regulations of the University currently in effect, or which are put into effect from time to time by the appropriate authorities of the University. At the same time, the individual is responsible for decisions and choices within the framework of the regulations of the community, as Duke does not assume *in loco parentis* relationships.

Students, in accepting admission, indicate their willingness to subscribe to and be governed by these rules and regulations. They acknowledge the right of the University to take disciplinary action, including suspension or expulsion, for failure to abide by the regulations or for other conduct adjudged unsatisfactory or detrimental to the University.

Responsibility for prescribing and enforcing rules and regulations governing student conduct rests ultimately with the Board of Trustees of Duke University and, by delegation, with administrative officers of the University. In the undergraduate schools, and in the University as a whole, many of these rules have been established over the years by cooperative action between students and administrative officers and, in the case of some rules, with participation of faculty members as well. Representative student organizations, such as student governments and judicial boards, and more recently, community-wide bodies of students, faculty, and administrators, have initiated proposals for policies and rules necessary to assure satisfactory standards in academic and nonacademic conduct. These proposals have been accepted by University officers and have become a substantial, if not all-inclusive, body of rules governing student life at Duke. For current regulations, refer to the *Bulletin of Duke University: Information and Regulations*.

Students in Trinity College of Arts and Sciences, the School of Engineering, and the School of Nursing constitute an undergraduate community whose members are subject to the Undergraduate Community Code. Violations of the code and of certain University regulations are adjudicated before the Undergraduate Judicial Board, composed of representatives of the student body, the faculty, and the administration. The constitution of the board, the Judicial Code of the Undergraduate Community, the procedural safeguards, and rights of appeal guaranteed to students are published in the *Bulletin of Duke University: Information and Regulations* for the undergraduate community. As provided in the judicial structure of the University, each residential unit has a judicial board which has jurisdiction over all offenses involving violations of regulations relating to dormitory procedures and social regulations not covered by the undergraduate community code or University policies and regulations. The Residential Judicial Board may function as an appellate body in cases involving appeals from the individual house judicial boards and has original jurisdiction in disputes involving two or more dormitories. For further information, refer to the *Bulletin of Duke University: Information and Regulations*.

Student Discrimination Grievance Procedures

The Duke University policy on nondiscrimination is set forth on the credits page of this bulletin. Procedures for investigation and remedy of any complaint and for appeal of any decision are detailed in the *Bulletin of Duke University: Information and Regulations*.

Student Obligations and Requirements

Students are expected to meet academic requirements and financial obligations, as specified elsewhere in this bulletin, in order to remain in good standing. Certain nonacademic rules and regulations must be observed also. Failure to meet these requirements may result in dismissal by the appropriate officer of the University.

Admission



Principles of Selection

James B. Duke, in his Indenture of Trust, requested that "great care and discrimination be exercised in admitting as students only those whose previous record shows a character, determination, and application evincing a wholesome and real ambition for life." In this light, and in view of the institution's limited enrollment, Duke University looks beyond the basic characteristics of academic competence possessed by the majority of applicants. It seeks, in each prospective student, regardless of race, sex, color, religion, handicap, or national origin, not only evidence of intellectual promise and maturity of judgment, but also a degree of positive energy. Often, this energy is expressed in the form of special talents and accomplishments; it is seen consistently in a student's determination to make creative use of the opportunities and challenges posed by Duke University.

Requirements for Application

As there are occasionally changes in admission policies or procedures after the printing deadline for the *Bulletin of Duke University: Undergraduate Instruction*, candidates are urged to consult the *Bulletin of Duke University: Information for Prospective Students* for specific admissions information, dates, and policies.

DEGREE STATUS

Although there are no inflexible requirements as to subject matter, students are urged to choose a broad and challenging high school program. At least twelve units of acceptable college preparatory work must be presented for review. Applicants to the School of Engineering are advised to take four units of mathematics and at least one unit of physics or chemistry.

The Scholastic Aptitude Test (SAT), given by the College Board, and three Achievement Tests (one of which must be in English composition, with or without essay) are required of all candidates for freshman admission and must be taken by December for February Notification and by January for April Notification. Since placement in foreign language study and fulfillment of the foreign language requirement can be determined by an Achievement Test score, it is recommended that a candidate who has studied a foreign language take the Achievement Test in that language. Candidates may submit results of the American College Testing Program (ACT) in lieu of SAT and Achievement Test scores, provided the test is taken by December of the senior year; the scores must be made available to the Admissions Committee thirty days before the decision date. Candidates for the

School of Engineering who elect to take the College Board test battery are required to take an Achievement Test in mathematics, either level 1 or level 2.

NONDEGREE STATUS

Summer Session. Persons who are or were at the time of leaving their home institutions in good standing in accredited colleges or universities may be admitted for summer study only by the Director of the Summer Session.

Continuing Education. Admission as a nondegree student at Duke is limited to: people residing in the area who, because of family and work responsibilities, have no other access to education; Duke graduates of the preceding year; people who will be moving to the area and who will reside here for a substantial period of time; local high school students; and Duke University employees. These students are given academic and career counseling by the Office of Continuing Education; they are subject to most of the regulations set forth for degree candidates.

Application Procedures

DEGREE STATUS

A Bulletin of Duke University: Information for Prospective Students, which contains the preliminary application, may be obtained from the Office of Undergraduate Admissions, Duke University, Durham, North Carolina 27706. A nonrefundable processing fee of \$35 must accompany the preliminary application form.

A personal interview at Duke is not required for admission; students who find it possible to visit the campus, however, may write for an interview or participate in one of the group information sessions held during particularly busy periods. Interviews cannot be granted from January through April, when applications are under review.

April Notification. Candidates for admission to the freshman class must submit preliminary applications by December 15 and final applications no later than January 15 of their senior year in secondary school. Decisions are mailed from the University by April 15, and accepted candidates are expected to reserve a place in the class by May 1 with a nonrefundable deposit of \$330.

February Notification. Students who indicate on their applications that they wish to learn of their admissions decisions by February 1 of their senior year must submit preliminary applications by November 1 and observe a December 1 final application deadline. Results of the Scholastic Aptitude Test and Achievement Tests (or the ACT) taken through December may be submitted for review. Applicants for February Notification are permitted to apply concurrently to other colleges, although those who are accepted by Duke in February must pay the nonrefundable registration and room deposit fees of \$330 by February 15 to reserve a place in the class. Because neither of the two notification dates is intended to be more competitive than the other, students who receive negative decisions in February will not have their applications reviewed again in April.

Midyear Admission. Midyear admission allows a limited number of freshmen to begin their college work a semester early or to postpone matriculation for a semester. Midyear applicants are expected to complete all the requirements for fall admission. The application deadline for new candidates is September 15 for the preliminary application and October 15 for the final application; students will be notified of the decision on their applications by November 15, with the expectation that those who are accepted will reply by December 1 with a nonrefundable deposit of \$330.

Transfer Admission. Transfer admission from other accredited institutions may be arranged for a limited number of students each semester. Because the

transcript of at least a full year of academic work is preferred by the Admissions Committee, and because transfer students are required to spend their last two years at Duke, most candidates apply to Duke during their third or fourth semester in college. Candidates submit official transcripts of all work completed at other accredited colleges, high school records, scores on the Scholastic Aptitude Test, and employment records if there has been an extended period of employment since graduation from secondary school, along with completed application forms. See the section on transfer credit in the chapter "Academic Procedures and Information."

All transfer students should expect to be responsible for their own off-campus housing arrangements for the fall and spring. Residence halls are available for summer occupancy only. The Office of Housing Management provides assistance to students who seek housing and/or roommates.

June (Term II, summer session) and September (fall semester) transfer students meet a March 1 preliminary application deadline and an April 1 final application deadline, learn of their decisions by May 15, and respond to the University by June 1 with a nonrefundable deposit of \$230. January transfer students submit preliminary applications by September 15 and final applications by October 15, learn of their decisions by November 15, and reply to the University by December 1.

NONDEGREE STATUS

Summer Session. Application forms and schedules of courses may be obtained by writing or calling the Office of the Summer Session, Allen Building, Duke University, Durham, North Carolina 27706; (919) 684-2621. No application fee is required.

Continuing Education. Applications may be obtained from the Office of Undergraduate Admissions and must be returned to that office, accompanied by a \$35 application fee, by July 15 for the fall semester and by December 1 for the spring semester.

At least four courses must be completed successfully before a nondegree candidate may apply for degree candidacy. Students who plan to complete the four courses should not expect automatic admission to the University. More detailed information is available from the Office of Continuing Education, 107 Bivins Building, Duke University, Durham, North Carolina 27708.

READMISSION OF FORMER STUDENTS

A student who desires to return, following withdrawal from college, should apply to the appropriate college or school. (See the section on readmission procedures in the chapter "Academic Procedures and Information.") Students who have been withdrawn from the University for five or more years must submit a new application to the Office of Undergraduate Admissions.

Financial Information



Tuition and Fees

No college or university can honestly state that an education at the college level is inexpensive. Fees paid by students cover less than half the cost of their instruction and the operation of the University. Income from endowment and contributions from alumni and other concerned individuals meet the balance and assure each student the opportunity to pursue an education of unusually high quality.

Students are urged to give their attention first to the selection of institutions which meet their intellectual and personal needs, and then to the devising of a sound plan for meeting the cost of their education. This process will require an in-depth knowledge of both the University's financial aid program and the resources of the student's family. A brochure describing in detail the various forms of financial aid may be obtained from the Office of Undergraduate Financial Aid, Duke University, Durham, North Carolina 27706.

Estimated Expenses.* Certain basic expenditures, such as tuition, room, and board, are considered in preparing a student's budget. These necessary expenditures, with a reasonable amount allotted for miscellaneous items, are shown below:

	<i>Academic Year, 1983- 84 (two semesters)</i>	<i>Two Summer Terms, 1983 (one semester equivalent)</i>
Tuition	\$6,780†	\$2,160-\$2,520
Residential Fee		
Single Room	\$1,553-\$2,038	\$781
Double Room	\$1,167-\$1,536	\$589
Food		
100% board plan	\$1,838	\$743
75% board plan	\$1,534	\$545
Books and Supplies	\$350	\$175
Student Health Fee	\$184	\$54

†For the Schools of Engineering and Nursing, the tuition is \$7,200

It should be realized that additional expenses will be incurred which will depend to a large extent upon the tastes and habits of the individual. The average Duke student, however, can plan on a budget of approximately \$11,230 for the academic year.* The budget estimate for the summer (two terms, one semester equivalent) is \$3,995.* These budgets are all-inclusive except for travel costs and major clothing purchases.

*The figures contained in this section are projections and are subject to change.

Registration Fees and Deposits for Fall and Spring. On notification of acceptance, students are required to pay a nonrefundable first registration fee of \$30 and to make a deposit of \$300. The deposit will not be refunded to accepted applicants who fail to matriculate. For those who do matriculate, \$100 of the deposit serves as a continuing residential deposit for successive semesters, and the remaining \$200 serves as a continuing registration deposit.

Late Registration. Continuing students who fail to register during the registration period must pay a fee of \$25 to the Bursar.

ROTC Deposit. An Air Force ROTC deposit of \$10 is required of students enrolling in air science to cover possible loss of military equipment issued to them. This deposit is refunded to the student upon return of issued equipment.

School of Nursing. Medical fees may be required for certain nursing electives.

Part-Time Students. In the regular academic year students who register for not more than two courses in a semester are classified as part-time students. Part-time students will be charged at the following rates: one course, \$848 (\$900 for engineering courses); half course, \$424; quarter course, \$212; one course plus laboratory or precept, \$1,130 (\$1,200 for engineering courses). Registration for more than two courses requires payment of full tuition. Graduate students registered for undergraduate courses will be assessed three units for nonlaboratory courses and four units for laboratory courses. Men and women in nondegree programs who are being considered for admission to degree programs, as designated by the Office of Continuing Education, pay fees by the course whether the course load is one, two, or three courses.

Auditors. Auditing one or more courses without charge is allowed for students paying full fees, provided that the consent of the instructor is obtained. Students who are enrolled for one or two courses may audit other courses by payment of \$85 for each course audited. With the consent of the appropriate instructor and the Director of Continuing Education, graduates of Duke may audit undergraduate courses for \$85 per course.

Payment of Accounts for Fall and Spring. Monthly invoices for tuition, fees, and other charges will be sent by the Office of the Bursar which are payable by the invoice due date; no deferred payment plans are available. As a part of the agreement of admission to Duke University a student is required to pay all invoices as presented. If full payment is not received, a late payment charge as described below will be assessed on the next invoice and also certain restrictions as stated below will be applied.

Late Payment Charge. If the *total amount due* on the student invoice is not received by the invoice due date, a penalty charge will be accrued from the billing date of the invoice. The penalty charge will be at a rate of 1½ percent per month (16 percent per annum) applied to the *past due balance* on the student invoice. The *past due balance* is defined as the previous balance less any payments and credits received during the current month and also any student loan memo credits, related to the previous balance, which appear on the invoice.

Restrictions. An individual will be in default of this agreement if the *total amount due* on the student invoice is not paid in full by the invoice due date. An individual who is in default will not be allowed to register for classes, receive a copy of the academic transcript, have academic credits certified, be granted a leave of absence, or receive a diploma at graduation. In addition, an individual in default may be subject to withdrawal from school.

Tuition and Fees for Summer Session. Tuition for undergraduates is \$540 for each nonlaboratory or 3 semester hour (s.h.) course, \$720 for each laboratory or 4 s.h. course, \$360 for each half course (2 s.h.), and \$1,080 for each one and one-half course program (6 s.h.) offered at the Marine Laboratory.

Tuition for graduate students taking an undergraduate course is as indicated above.

Health Fee. Students are required to pay \$27 per term or complete a waiver form. Students at the Marine Laboratory are required to pay \$21 per five-week registration period or complete a waiver.

Studio Fee. A fee of \$40 will be charged for each studio art class.

Auditing Fees. With permission of the instructor and the Director of the Summer Session, students registered for a full course program (two courses) may audit nonlaboratory courses except physical education and dance activity courses, studio art courses, and applied music courses. No extra charge is made.

Students carrying less than a full course program may be granted permission by the instructor and the Director of the Summer Session to audit a course (the above exceptions apply) but must pay half the University fee for the course.

Payment of Tuition and Fees. The University does not mail statements for summer session tuition and fees. All tuition and fees should be paid in the Office of the Bursar (101 Allen Building) at least three full working days prior to the first day of class (see summer session calendar). Students registering by mail may forward payment to the Office of the Bursar, 101 Allen Building, Duke University, Durham, North Carolina 27706. Failure to pay tuition and fees by the end of the drop/add period will result in administrative withdrawal of the student (see the section on refunds and withdrawal charges concerning penalties in this chapter). Students who have been withdrawn may not attend class or subsequently be registered for the term. Students who are unable to meet these deadlines should consult with the Bursar prior to the deadline.

Late Fee. Students who fail to pay tuition and fees before three full working days prior to the first scheduled class day of a given course will pay an extra charge of \$25.

Transcripts. Requests for transcripts of academic records should be directed to the Associate Registrar. Ten days should be allowed for processing. A fee of \$1, payable in advance, is charged for each copy.

Duke Employees. Full-time employees with one or more years of service with the University may request permission to take for credit or audit up to two courses during any one semester or one during a summer term. Permission may be granted based on the individual merits and circumstances of each application. Employees receiving permission to take such courses for credit will be charged one-half the tuition rate shown above for part-time students during the fall and spring and one-half of the summer tuition rate. Employees taking courses must see Harrison Brooke or Cynthia Shumate (303 Allen Building) to obtain approval and a tuition reduction voucher to cover the remaining half of the tuition. Employees are required to submit a formal application by December 1 for the spring semester, or July 15 for the fall semester.

Living Expenses*

Housing for Fall and Spring. In dormitories for undergraduate students the housing fee for a single room ranges from \$1,553 to \$2,038 for the academic year; for a double room, the fee ranges from \$1,167 to \$1,536 per occupant.

To reserve University housing for the fall semester, returning students who are eligible for and wish to occupy such housing must make a \$50 prepayment of the housing fee at a designated time during the spring semester.

Detailed information concerning the student's obligations under the housing contract and the consequences of failure to comply are published in the *Bulletin of Duke University: Information and Regulations*.

*The figures contained in this section are projections and are subject to change prior to the beginning of the fall 1983 semester.

Housing for Summer. For detailed information on types and costs of accommodations available at Duke University for the summer session write: Department of Housing Management, Duke University, Durham, North Carolina 27706.

Food Services. See the section on dining facilities in the chapter "Campus Life and Activities" for a description of dining facilities on both campuses and the options or requirements for board contracts. The charge for board ranges from \$545 to \$919 per semester, payable at the time of registration. For summer terms, optional board contracts are available. Meals may also be purchased on an a la carte basis.

Fall and Spring Refunds

In the case of withdrawal from the University, students or their parents may elect to have tuition refunded or carried forward as a credit for later study according to the following schedule:

<i>Withdrawal</i>	<i>Refund</i>
Before classes begin	Full amount
During first or second week	80 percent
During third, fourth, or fifth week	60 percent
During sixth week	20 percent
After sixth week	None

Tuition charges paid from grants or loans will be restored to those funds on the same pro rata basis and will not be refunded or carried forward. The schedule also applies to housing charges of students moving from University housing to off-campus housing. In the event of death, a full tuition and fees refund will be granted.

In the case of changing category from full-time to part-time, dropping special fee courses (e.g., music, art, golf), or dropping audit courses, a full refund will be granted students during the drop-add period. Subsequent to the drop-add period changes of category will not be allowed from full-time to part-time. Students may, however, withdraw from courses after the drop-add period with no refund or add new courses if the proper tuition is paid.

The registration deposit will be refunded to students whom the University does not permit to return, who graduate, or who request the refund prior to registration, thereby indicating their intention not to return for the following semester. The registration deposit will not be refunded to students who register for the following semester but fail to enter. Arrangements for refund of the \$100 residential deposit are described in information furnished to each student by the Department of Housing Management.

Summer Refunds and Withdrawal Charges†

Students who will not be attending a summer term or course for which they have registered (course card submitted) must drop the course(s) prior to the beginning of class, *even if they have not paid tuition and fees*. Failure to drop the course(s) will result in administrative withdrawal at the end of the first three days of the term and billing of the student for 20 percent of the tuition plus the health fee. If tuition and fees have been paid, the following refund policies apply:

1. Full tuition and fees are refunded if the student notifies the Director of the Summer Session of the withdrawal from a course(s) or the term before the first day of class.
2. Eighty percent of the tuition is refunded if the student notifies the Director of the Summer Session of the withdrawal from a course(s) or the

†This policy does not apply to foreign programs.



term during the first three days of class. The health fee is not refunded. There is no charge for drop/adds that result in no change in tuition.

3. There is no refund of tuition and fees if the student withdraws from a course(s) or the term after the third day of class.

Student Aid

Duke University has a comprehensive aid program that includes both merit and need-based scholarships, college work-study, the National Direct Student Loan (NDSL) Program, and the Guaranteed Student Loan Program (GSL). Need is

the primary concern in the issuing of financial aid. Demonstrated need is determined by means of a nationally accepted formula, approved by the Department of Education.

For the student with demonstrated need, the net cost of an education at Duke University will generally be no greater than that for college attendance at a private institution elsewhere. It is the intention of the Office of Undergraduate Financial Aid to set each award at a level consistent with a student's ability to meet the costs of attending Duke University. This will be done by taking into consideration the contribution that can reasonably be expected from the student, the family, and any available outside sources. During the current academic year, approximately one-third of the student body receives more than eleven million dollars in aid of various types.

Financial Aid for Entering Freshmen. Candidates should initiate their application for financial aid concurrently with their application for admission during the fall semester of their senior year in secondary school. Instructions concerning the specific requirements and deadline dates will accompany application materials. The Financial Aid Form (FAF) must be submitted to the College Scholarship Service. In divorce cases, the University requires both parents to complete and submit a FAF. This form may be obtained either from a high school guidance counselor or from the financial aid office. A notarized copy of all pages, including schedules and attachments, of the parents' current Federal Income Tax Form 1040 must be submitted to the financial aid office on or before May 1. Information provided on the FAF will be validated through the use of the 1040 tax return.

Financial aid recipients wishing to operate a motor vehicle on campus must first register it with the financial aid office. As an automobile represents an asset, the value of a financial aid recipient's car will be considered in the estimation of a student's need. As a general rule, a student's annual contribution will be increased by 35 percent of the value of the car.

Renewal of Financial Aid after the Freshman Year. Each year students must file an application for renewal of financial aid. This application must include a new Financial Aid Form and a notarized copy of all pages, including schedules and attachments, of the parents' current Federal Income Tax return.

To have financial aid renewed, a student must be in good academic standing with the University. A. B. Duke and J. A. Jones scholars are expected to maintain an average considerably higher than the minimum. Specific details regarding their standards will be provided to scholarship winners.

Types of Financial Aid. Gift scholarships or grants, long-term loans, and employment are integral parts of the financial aid program, and some portion of the aid offered an undergraduate is normally in each of these forms.

The work-study opportunity and loan(s) offered as financial aid are considered to be the self-help portion of the award. The standard aid package at Duke provides that the first \$2,500 to \$3,000 of each student's need be awarded in the form of self-help funds. Funds awarded in excess of this amount will be grant funds. This combination of University grant funds and opportunities for self-help enables Duke to extend its resources to a larger number of deserving students. A student may choose not to accept any portion of an aid award with the understanding that the responsibility for providing the dollar equivalent is accepted by the individual.

Duke has several scholarships based on need which are available from personal endowments and corporations. Some are intended for entering freshmen, whereas others are awarded to upperclass students. These scholarships may be based on achievement in a particular field or on an outstanding overall record.

Gift Scholarships. The following are among the named gift scholarships offered through Duke University:

Angier B. Duke Memorial Scholarships. The Angier B. Duke Memorial Scholarships, competitively awarded on the basis of academic merit, have been established to encourage the intellectual achievement of men and women by recognizing those who possess outstanding academic and leadership abilities. Candidates are selected on the basis of intellectual performance, creative talent, and promise of being eventual leaders in whatever field of endeavor they choose. The scholarship is a four-year program (eight semesters), and a student's continuation in the program is contingent upon good academic performance. All 1982-83 scholarship holders received \$6,210 if enrolled in Trinity College of Arts and Sciences, and \$6,510 if enrolled in the School of Engineering. Twenty scholarships are awarded each year. Students demonstrating additional need will receive a grant from Duke University funds up to the amount needed. All Angier B. Duke Scholars participate in a six-week summer study program at Oxford University in England after the junior year. Under the program the scholarship pays tuition, single room accommodation, full board, designated excursions for all scholars, and an allowance for transatlantic air fare between New York and London. Those choosing not to participate in the Oxford program are eligible for a \$2,000 grant for an approved independent project. At least one of the four years of the scholarship could be used abroad on an approved program.

W. N. Reynolds Memorial Scholarships. Recipients of these awards are students with outstanding ability and/or need who show promise of constructive leadership. In considering candidates for the awards, consideration will be given in the following order: (1) children of employees of R. J. Reynolds Tobacco Company or any of its affiliates or subsidiaries; (2) children of families residing in Forsyth County, North Carolina; and (3) other candidates who are residents or natives of North Carolina. There are four awards available for each freshman class with a value of \$500 to \$3,600 annually.

A. J. Fletcher Scholarships. These music department scholarships are given to students who can demonstrate, by tape or audition, talent and achievement in instrumental or vocal performance. These awards are \$500 per year and are renewable annually for up to four years. Although recipients are not required to major in music, they are expected to study privately and to participate in departmental performing groups.

United Methodist Scholarships. A number of United Methodist Scholarships, valued at \$500 per year, are available on a basis of demonstrated need to Methodist students who have given evidence of leadership in their local Methodist Youth Fellowship groups.

Alice M. Baldwin Scholarships. One or more of these scholarships, varying in amount from \$500 to \$1,500, are awarded to rising seniors in Trinity College of Arts and Sciences on the basis of scholarship, character, and leadership.

Evelyn Barnes Memorial Scholarship. One \$400 or two \$200 grants are awarded to undergraduate women who are contributing to the musical life of the University. Scholarship, character, and leadership are considered. Recommendation by a member of the music faculty is required.

Panhellenic Scholarship. A scholarship of approximately \$500 is awarded to an upperclass woman in Trinity College of Arts and Sciences on the basis of scholarship, character, leadership, and service.

Delta Delta Delta Scholarship. A scholarship of \$200 is awarded by Delta Delta Delta to an undergraduate woman on the basis of scholarship and character. The winner of this award is eligible to compete for the national award of a Delta Delta Delta Scholarship of \$1,000.

J. Welch Harriss Scholarships. Recipients of these scholarships will receive \$1,000 per year without reference to need. If demonstrated need exceeds \$1,000, then the scholarship will be adjusted accordingly. These awards are made to freshmen who have achieved outstanding academic records. They are renewable each year as long as the student remains in good academic standing. Consideration will be given in the following order: (1) students from High Point, North Carolina; (2) students from Guilford County, North Carolina; and (3) students from North Carolina.

Florence K. Wilson Scholarships. Grants-in-aid are made each year from the Florence K. Wilson Scholarship Fund to nursing students qualifying for financial assistance. This fund was established in 1961 by combining the School of Nursing's Alumnae Association Fund, the students' Florence K. Wilson Scholarship Fund, and contributions from the Wilson family and friends.

Alyse Smith Cooper Scholarships. Each year six or more scholarships of various amounts are awarded to students demonstrating both talent and need. Preference is given to students from Alamance County, North Carolina. Majors in music, particularly students of piano, organ, and voice, receive special consideration.

Braxton Craven Endowed Scholarships. Recipients of these scholarships will receive an amount equal to the current tuition at Duke. Braxton Craven scholars will be chosen on the basis of outstanding academic and extracurricular achievement. First preference is given to Davidson County, North Carolina, residents and second preference to students from North Carolina. The scholarships are approved on a continuing basis, providing satisfactory academic progress is achieved.

Marian Sanford Sealy Scholarship Fund. Established in 1966 with an initial gift from the Durham-Orange County Medical Auxiliary, the Marian Sanford Sealy Scholarship is awarded to a nursing student demonstrating financial need. Personal qualifications supportive of potential to become an outstanding nurse and a distinguished academic record are the criteria for the awarding of this scholarship.

Lelia R. Clark Scholarship in Nursing. The Duke Hospital Auxiliary established the Lelia R. Clark Scholarship in Nursing in 1971 to cover tuition for a nursing student, preferably one from North Carolina. Prerequisites for the award are a commendable academic record, financial need, and exemplification of the qualities of a person committed to serving others.

J. A. Jones Memorial Scholarships. The scholarships, sponsored through the Jones Fund for Engineering, are awarded to engineering students whose outstanding academic and personal qualifications suggest that they will become leaders in a technological society. The awards range from a yearly sum of \$500 to \$5,500, depending on the degree of need.

Robert H. Pinnix Scholarships. The Robert H. Pinnix Scholarships are awarded annually to two upperclassmen enrolled in the Duke School of Engineering. The award is based upon demonstrated ability, excellence in engineering, and financial need.

Scholarships for Foreign Students. A limited number of awards will be made each year to qualified students from other countries who enter as freshmen. Candidates for these awards are required to submit the Application for Scholarship and Financial Aid and the Financial Aid Application for Foreign Students provided by the Office of Undergraduate Financial Aid of Duke University. Two named awards bring foreign students to the campus: the Carol Cranmer Scholarship (named for a former student) and the Roberta Florence Brinkley International Scholarship (named for a former Dean).

The Mary Duke Biddle Scholarship in Music Composition. This scholarship with a stipend of \$3,500 per year is available to a member of each entering class. It is renewable from year to year so long as the student does satisfactory work. Students wishing to apply for this award will be required to submit examples of their composition. Eligibility is limited to students planning to major in music.

AFROTC College Scholarship Program. Students can apply for three-year scholarships during their freshman year and two-year scholarships during their sophomore year. Scholarships are available to students who qualify for flight training and to students who major in certain scientific or engineering fields. The scholarships include tuition, fees, and textbook reimbursement, plus a \$100 per month tax-free allowance.

Army ROTC Scholarship Program. All freshman and sophomore students are encouraged to apply for Army ROTC scholarships. Awarded without regard to academic major, these grants pay tuition, fees, and textbook/equipment costs in addition to providing a tax-free monthly stipend of \$100 for the balance of the student's normal period to graduation. Commissioned service, following graduation, can be either on active duty or with the reserve forces. Additional information concerning Army ROTC scholarships is available from the Professor of Military Science.

NROTC College Scholarship Program. This program provides for up to four years' tuition and textbooks, laboratory fees, and a \$100 per month stipend. These scholarships, based upon academic achievement, leadership potential, and overall performance, can be awarded at any stage of the student's college career through either a nationwide selection process or by the Professor of Naval Science at the University. In addition, two other two-year scholarships are available to rising juniors: one leads to a career in nuclear power, and the other follows a summer attendance at the Naval Science Institute at Newport, Rhode Island. For further information on any of the above scholarship programs, contact the Professor of Naval Science.

North Carolina Legislative Tuition Grant. The North Carolina General Assembly established a program of tuition grants available to North Carolina residents who are full-time students at in-state private colleges and universities. The grant for each eligible student is \$325 per semester or \$650 per academic year for 1983-84.

The Minnie Happer Pruden Scholarships. These scholarships are available to the daughters of Episcopal clergymen.

The Huguenot Scholarship. A scholarship of \$1,000 per year is available from the Huguenot Society of America to a descendant of a Huguenot.

North Carolina Math Contest. Upon enrolling at Duke, each student finishing in the top twenty in the North Carolina Math Contest is eligible to receive a scholarship equal to the amount of tuition. This scholarship is available for each of the four years of undergraduate study as long as the student maintains a 3.0 average.

Duke North Carolina Honors. Scholarships funded by Duke University are awarded annually to selected incoming freshmen from North Carolina. Scholarships are renewable for the four years of undergraduate study as long as the student maintains a 3.0 average. Scholarships are valued at \$1,500.

Reginaldo Howard Scholarships. These scholarships, awarded annually to freshmen minority students, are provided to honor the late Reggie Howard, first black president of the student government. Ten scholarships of \$1,000 are awarded each year. Scholarships are available for the four years of undergraduate study as long as the student maintains a 3.0 average.

Alumni Endowed Scholarships. Three \$3,000 per year Alumni Endowed Undergraduate Scholarships are awarded to students who demonstrate superior academic ability and leadership potential. These awards are renewable annually, based on satisfactory performance at Duke. Each scholar is afforded an opportunity to participate in alumni travel programs, seminars, and internships. Although not restrictive, preference is given to children of alumni who apply for February notification.

Loans. The loan programs which are available to students through Duke University are listed below:

National Direct Student Loan Program. Loan funds supplied by the federal government and Duke University through Part E of Title IV of the Higher Education Act of 1965 are available to qualified students. Repayment of loans under this act normally begins six months after the student is graduated or leaves college, with complete payment scheduled within a ten-year period. Interest accrues at the rate of 5 percent annually, commencing six months after the borrower ceases to be at least a half-time student at an institution of higher education. This loan is part of the student's financial aid award.

Guaranteed Student Loan Program. Loans under the Guaranteed Student Loan (GSL) program are available from banks or other incorporated state lending agencies. Duke University has a very limited amount of funds available to provide GSLs to students who are unable to arrange them with local lenders. Need will be a factor in the University's decision regarding GSL applications. The program enables students from families with adjusted gross incomes of \$30,000 or less to qualify for these loans; students from families whose most recent yearly adjusted income exceeds \$30,000 may qualify by submitting a GSL Needs Test along with the application. The limit on a GSL, which has an interest of 9 percent, is \$2,500 a year if borrowing from a bank or outside agency and \$1,500 a year if borrowing from the Duke Guaranteed Loan Program. Additional information about this loan program may be obtained from the undergraduate financial aid office.

Parents' Loan for Undergraduate Students Program. Parents may borrow through the Parents' Loan for Undergraduate Students (PLUS) program. Repayment of these loans begins sixty days after loan disbursement. Interest is 12 percent and begins to accrue at the point repayment begins. Interested parents should contact their home state lending agency.

Children of Methodist Ministers. Children of ministers in the North Carolina and the Western North Carolina Annual Conferences of the United Methodist Church may be eligible to receive a partial tuition grant of \$750 per semester for a maximum of eight semesters of undergraduate study at Duke University. Eligibility is met by the parent being in a regular pastoral appointment and resident in one of the conferences. When the parent is in a special appointment and resident in one of the conferences, eligibility will be determined on an individual basis, depending upon the nature of the appointment. In all cases the decision of the University will be final.

Employment. Most financial aid recipients are offered a job as part of their aid package. These jobs require between eight and ten hours a week and provide an average stipend of \$1,000. The money is paid directly to the student. The Office of Placement Services maintains part-time employment listings for the campus and Durham area. All students interested in working during the school year should register at the beginning of the semester. Every effort will be made to help students find jobs consistent with their interests.

Duke University also expects that students receiving financial aid will work during the summer. In the summer before entering college, a freshman should save \$900 for use during the first year of college. In subsequent summers, the student should save \$1,100 to be used for college expenses.

Tuition Plans. Many families finance a college education with the assistance of an insured tuition payment plan regardless of whether they receive financial assistance from Duke. Although these plans are sponsored by a number of private firms, the University refers parents to plans provided by the Richard C. Knight Insurance Agency, Inc. The company provides the University with the full sum required each semester and arranges a schedule for monthly repayment by the subscribing families. The schedules for repayment vary with the program offered by the company. Additional information on this particular tuition payment plan may be obtained by writing to Richard C. Knight Insurance Agency, Inc., Insured Tuition Payment Plan, 53 Beacon Street, Boston, Massachusetts 02108.

Courses of Instruction



Definition of Terms

Courses taught in 1981-82 or in 1982-83 or scheduled for 1983-84 are included in this chapter with full descriptions. Additional courses, that were taught prior to 1981-82 and that are likely to be taught in the future, are listed separately by number and title only under the heading *Courses Currently Unscheduled*. For courses which will be offered in 1983-84, consult the *Official Schedule of Courses*.

Introductory level courses are numbered below 100; advanced level courses are numbered 100 and above. Courses numbered 1 through 49 are primarily for freshmen; courses numbered from 200 through 299 are primarily for seniors and graduate students. (See the section on course load and eligibility in the chapter "Academic Procedures and Information.")

Odd-numbered courses are usually offered in the fall semester; even-numbered courses in the spring semester. Double numbers separated by a hyphen indicate that credit is contingent upon completion of both courses. Double numbers separated by a comma indicate that although the course is a year course, credit may be received for either course or both courses.

The following symbols, suffixed to course numbers, identify the small group learning experiences: *S*, seminar; *P*, preceptorial; *T*, tutorial; *D*, discussion section. The *L* suffix indicates that the course includes laboratory experience. *C-L*: denotes a course that is cross-listed or a program under which a course is listed.

Trinity College of Arts and Sciences

Professor Friedl, *Dean of Arts and Sciences and of Trinity College*; Associate Professor Eldridge, *Associate Dean*; Assistant Dean Bryan, *Coordinator for Curriculum*; Assistant Dean Nathans, *Director of Premajor Advising Center*; Assistant Dean Wilson, *Coordinator for the Dean's Staff*; Assistant Dean Wittig, *Coordinator for Study Abroad Programs*; Assistant Deans Bryant and Harrison

Afro-American Studies (AAS)

The program in Afro-American Studies provides instruction directed toward the experience and concerns of black America. The courses encompass the black experience in America and the black experience as illuminated by literary, religious, and cultural evidence generated by black Americans. The courses in the program are essential components of a liberal arts education and may constitute a major or complement another major. In addition to the courses listed below, many related courses are offered. Descriptions can be found under the Departments of

Anthropology, Economics, History, Political Science, Public Policy Studies, Religion, and Sociology. Swahili courses are described under Asian and African Languages. Further information is available in 107 Allen Building.

56. The Black Religious Experience in America. C-L: Religion 56. One course. *Lincoln*

74. Introduction to Jazz. C-L: Music 74. One course. *Staff*

138. Political Leadership in the Black Church. C-L: Religion 138. One course. *Lincoln*

144. Black Cults and Sects in America. C-L: Religion 144. One course. *Lincoln*

145, 146. Afro-American History. C-L: History 145, 146. Two courses. *Gavins*

173, 174. Afro-American Literature. C-L: English 167, 168. Two courses. *K. Williams*

209S, 210S. Selected Topics in Afro-American History, 1619–Present. C-L: History 209S, 210S. Two courses. *Gavins*

265. Religions of the West Africa Diaspora. C-L: Religion 265. One course. *Lincoln*

THE MAJOR

Eight courses are required for the major. The course of study for each student is planned by the student and the student's adviser in the light of the student's interests and goals.

Air Force Aerospace Studies

For courses in Air Force aerospace studies, see the Reserve Officers Training Program.

Anthropology (AN)

Professor O'Barr, *Chairman*; Associate Professor Glander, *Director of Undergraduate Studies*; Professors Fox, Friedl, and Simons; Associate Professors Apte, Cartmill, Hylander, Quinn, and Smith; Assistant Professors Domínguez, Gaines, Weller, and Zagarell; Professor Emeritus La Barre; Adjunct Associate Professors Kay (anatomy) and Stack (public policy studies)

Students without prerequisites for a course may ask the instructor for admission.

93. Human Origins. Origins and distribution; primate evolution; a survey of human paleontology and human biology, prehistory, and language; and the origins of human social organization and culture. One course. *Staff*

94. Elements of Cultural Anthropology. The dynamics of culture and society; form and function of social institutions. Emphasis is upon primitive societies. C-L: Comparative Area Studies. One course. *Staff*

99. Perspectives in Archaeology. See Interdisciplinary Course 99. C-L: Classical Studies 99 and Religion 99. One course. *Meyers, Younger, and Zagarell*

101, 102. Introduction to the Civilizations of Southern Asia. C-L: Interdisciplinary Course 101, 102. Two courses. *Lawrence and staff*

105. History of Anthropology. Introduction to the origins and development of anthropology as a professional discipline in the Western world, with emphasis on cultural anthropology. Cultural milieu in America, Britain, and France and its effects on the subsequent professionalization and institutionalization of the discipline. One course. *Fox*

107. Introduction to Linguistics. Origin and nature of language; methods of descriptive linguistics with reference to historical and comparative linguistics. Prerequisite: sophomore standing. C-L: English 111 and Linguistics. One course. *Apte, Butters, or Hull*

115. Sex Roles: A Comparative Perspective. Examination of social, cultural, and biological bases for variation. Emphasis on division of labor, power, autonomy, and ideology in societies ranging from hunters and gatherers to contemporary industrial states. C-L: Comparative Area Studies. One course. *Staff*

116. Language, Ethnicity, and New Nations. Examination of problems facing newly independent countries of Asia and Africa in developing national integration; from the theoretical perspectives of sociolinguistics and anthropology. Prerequisite: Anthropology 94. C-L: Comparative Area Studies and Linguistics. One course. *Apte*

117. Language, Law, and Politics. Theories of language in political and legal processes, bilingualism, strategic use of language, political rhetoric, discrimination through language. Primary ethnographic materials from the United States and Canada. Prerequisite: Anthropology 94. C-L: Canadian Studies and Linguistics. One course. *O'Barr*

118. The Language of Advertising. Topics include: history and development of the genre of advertising language; comparisons to the specialized language used in medical, legal, and other professional contexts; and relation of topics to sociolinguistic theories and anthropological field methods. Primary focus on American television, print, and radio advertising and consideration of advertising language in certain other cultures. Directed field projects. C-L: Linguistics. One course. *O'Barr*

119. Language, Culture, and Society. Analysis of language behavior within and across societies relating variations in linguistic usage to sociocultural factors: ethnosemantics, social dialects, and ethnography of speech. Prerequisite: Anthropology 94. C-L: Comparative Area Studies and Linguistics. One course. *Apte or Weller*

120. Peoples of the World: South Asia. Survey of indigenous cultures and societies of India, Pakistan, Sri Lanka, Bangladesh, Nepal, and Bhutan with emphasis on social institutions, behavioral patterns, value systems, and sociocultural change. Prerequisite: Anthropology 94. C-L: Comparative Area Studies. One course. *Apte or Fox*

121. Peoples of the World: China. Anthropological approaches to traditional China and the People's Republic of China. Topics include economic development, political activity, village life, religion, dissidence, and rebellion. C-L: Comparative Area Studies. One course. *Weller*

122. Peoples of the World: Africa. A survey of the indigenous cultures and societies of Africa through the study of kinship, politics, economics, religion, and sociocultural change. Prerequisite: Anthropology 94. C-L: Comparative Area Studies. One course. *O'Barr*

124. Peoples of the World: American Indian. A comprehensive survey of the Indians of North and South America, including a study of origins and prehistory,

archaeology, racial affiliations, languages, material culture, social and political organization, economics, and religion, discussed in terms of the "culture area." C-L: Comparative Area Studies. One course. *Staff*

126. Peoples of the World: Middle East. Social relations and political and institutional consequences. Topics include male-female relations, tribal allegiance, traditional and experimental forms of family organization, ethnic and national identities and conflicts, and the impact of colonialism and the modern world system on the region. One course. *Domínguez*

127. Peoples of the World: Mesoamerica. Development and organization of diverse societies and institutions in Mexico and Guatemala. Prerequisite: Anthropology 94. C-L: Comparative Area Studies. One course. *Smith*

128. Peoples of the World: Caribbean. The social, economic, and political development of Caribbean societies within the world system; social differentiation, cultural fragmentation, colonialism, and dependence; the effects of slavery on contemporary Caribbean societies; the Caribbean diaspora and the Caribbeanization of the United States. C-L: Comparative Area Studies. One course. *Domínguez*

130. Social and Cultural Change. Contemporary theories of change, including innovation, acculturation, and modernization. Prerequisite: Anthropology 94. C-L: Comparative Area Studies. One course. *O'Barr or Smith*

132. Human Evolution. Evolutionary biology of the primates. Anatomical and behavioral adaptations and phylogeny of fossils and living primates including *Homo sapiens*. Prerequisite: Anthropology 93 or equivalent. One course. *Cartmill, Glander, or Simons*

133. The Effects of Colonialism and Neocolonialism on Native Peoples. The effect of governmental policies and interests, dominant populations, and local and international economic concerns on indigenous peoples, whether living as enclaves in nation states or as dependencies. C-L: Comparative Area Studies. One course. *Quinn or Smith*

134. Political Anthropology. Comparative study of politics and government in tribal and peasant societies. Evolution of political systems. Political changes resulting from contact and colonialism. Prerequisite: Anthropology 94. C-L: Comparative Area Studies. One course. *O'Barr or Smith*

135. American Culture. The shared understandings which characterize American culture, and the way in which this cultural knowledge is learned and organized, in domains such as kinship, marriage and family, child rearing, work, economic behavior, ethnicity, personality and character, gender, health and illness, and social interaction. One course. *Domínguez, Gaines, Quinn, or Stack*

136. Cross-Cultural Studies of Child Socialization. Effects of socialization on behavior. Child-rearing theory and practice in different cultures. Relevance of cross-cultural findings for child development theory. One course. *Quinn*

137. Incest, Adultery, and Other Problems in Kinship and Marriage. Cross-cultural attitudes to human sexuality. Varieties of family life and its integration in the political and economic context of human societies. Examples include indigenous North America and modern American societies. Prerequisite: Anthropology 94. One course. *Domínguez or Quinn*

140. The Anthropology of Race. Human biological variation and the historical development of the race concept in physical anthropology; folk concepts of race and the political-economic causes of racism. One course. *Fox*

143. Primate Biology. A comprehensive survey of primate feeding strategies and general ecology. One course. *Glander or Simons*

- 144. Evolutionary Study of Behavior.** Phylogenetic comparison of communication, infant socialization, aggression, and sexual behavior as they pertain to species group structure. Emphasis on primates. One course. *Glander or Simons*
- 145. Medical Anthropology.** Evolution and disease, theories of disease and healing; and factors influencing behavior in health and illness. One course. *Gaines or Weller*
- 147, 148. Introduction to Islamic Civilization.** Prerequisite: consent of Director of Undergraduate Studies. C-L: Interdisciplinary Course 162, 163. Two courses. *Richards*
- 155. Anthropological Approaches to Religion.** Cross-cultural perspectives on the relationship of religion to experience, behavior, conflict, and change. C-L: Comparative Area Studies. One course. *Gaines or Weller*
- 160S. Anthropology and Literature.** The interrelationships of literature, both oral and written, and social structure and cultural patterns. Special emphasis on oral literature. One course. *Apte*
- 164. Peasantry and Peasant Movements.** The genesis of peasant movements. Forms of peasant protest and its role in the economic, political, and ritual life of societies. Case studies from Western and Eastern societies, past and present. Prerequisite: Anthropology 94. C-L: Comparative Area Studies. One course. *Fox, Smith, or Weller*
- 165. Psychological Anthropology.** Anthropological contributions to sociobiology, socialization theory, social psychology, and cognitive science in the effort to understand human nature. One course. *Quinn and Gaines*
- 166. Introduction to Archaeology: Humans and Culture.** Modern methodology and analysis, theories of cultural evolution, survey of world prehistory with an exploration of the uses of ethnographic analogy. Prerequisite: Anthropology 93 or 94. One course. *Zagarell*
- 167. Prehistoric Technology.** Procurement of raw materials, manufacturing of objects, and the usage of these objects in archaeological context. One course. *Zagarell*
- 168. Beginnings of Civilization.** Cultural developments from the beginning of agriculture to the rise of civilization in Africa, Mesoamerica, Peru, India, Southwest Asia, and China, using archaeological and ethnographical examples. C-L: Comparative Area Studies. One course. *Zagarell*
- 170. Economic Anthropology.** Primitive, peasant, and world-system economics, and theories that both accept and challenge the neoclassical framework. Topics include primitive and complex modes of production, exchange, and marketing; the rise and organization of the capitalist world economy; and the transformation of precapitalistic modes of production and exchange in the modern world. Prerequisite: Anthropology 94. C-L: Comparative Area Studies. One course. *Quinn or Smith*
- 180. Current Issues in Anthropology.** Selected topics in methodology, theory, or area. One course. *Staff*
- 193. Independent Study.** Directed reading and research. Open only to qualified seniors, with consent of Director of Undergraduate Studies. One course. *Staff*
- 195S, 196S. Senior Seminar.** Prerequisites: Anthropology 94 and any 100-level course in anthropology, as well as consent of Director of Undergraduate Studies. Two courses. *Staff*

For Seniors and Graduates

204S. The Anthropology of Cities. Organization and behavior in urban centers from an evolutionary perspective; cross-cultural analysis of cities. Prerequisite: Anthropology 94. C-L: Canadian Studies and Comparative Area Studies. One course. *Fox or Smith*

205. The Anthropology of Anthropology. Effects of the organization and professional status of anthropological schools in the United States, Britain, and France up to World War II as they affected anthropological theory. Prerequisite: major in anthropology or graduate standing. One course. *Fox or Weller*

206S. Current Theoretical Schools in Anthropology. The theoretical schools since World War II, including cultural materialism and neo-Marxism, structuralism, cognitive anthropology, cultural analysis and symbolic anthropology, transactional analysis, and sociobiology. Prerequisite: Anthropology 94 or graduate standing or permission of instructor. One course. *Apte, Fox, Gaines, Smith, or Weller*

211S. Ethnography of Communication. History of the mutual influence of linguistics and anthropology leading to the development of ethnography of speaking, ethnoscience, structuralism, and sociolinguistics. Topics vary each semester. Prerequisite: Anthropology 111 or 119. C-L: Linguistics. One course. *Apte, O'Barr, or Weller*

215S. Gender Roles in Cross-Cultural Perspective. Theories of gender roles and of their relationships to kinship, marriage, inequality, and politics. One course. *Domínguez, Quinn, or Smith*

228S. Slavery and Society. Western and non-Western systems of slavery and their effects on social organization, self-concepts, and race relations. One course. *Domínguez*

237S. Interpretations of Kinship. The major interpretations of kinship in social organization. One course. *Domínguez or Quinn*

239. Culture and Ideology. Major theories about the relation between ideologies and social/economic systems. Readings from the works of Marx, Weber, Gramsci, Althusser, Geertz, and others. C-L: Comparative Area Studies. One course. *Weller*

241. The Rise of Civilization in Mesopotamia and Iran. An introductory survey of the major stages of developments from the beginnings of agriculture to the collapse of the early state-system (10,000-1,800 B.C.E.). Archaeological and textual evidence, focusing on the rise of the Mesopotamian state-system, the nature of that system, and the mechanisms leading to its collapse. C-L: Comparative Area Studies. One course. *Zagarell*

243S. Theory and Method in Archaeology. Techniques of geochronology, environmental reconstruction, sociocultural reconstruction, and statistical analyses applied to problem areas in archaeology. Prerequisite: Anthropology 166. One course. *Zagarell*

244S. Primate Behavior. Social behavior of prosimians, monkeys, and apes and the evolutionary development of primates. One course. *Glander*

246S. The Primate Fossil Record. Evolution of humans and other primates as inferred from fossil remains. Prerequisite: a course in human evolution. One course. *Cartmill, Kay, or Simons*

251S. Ethnography of Humor. Examination of theoretical framework, research methods, and data collection techniques for the analysis of humor with the goal of discerning normative behavioral patterns, expectations regarding social

roles, interpersonal relationships and social institutions, and the nature of ideologies and world views, within and across cultures. Prerequisite: Anthropology 94. One course. *Apte*

255S. Ethnopsychiatry, Ethnomedicine, and Cross-Cultural Psychiatry. In-depth consideration of these and other topics in medical anthropology. Topics vary each semester. Prerequisite: Anthropology 145 or 165. One course. *Gaines*

258S. Symbols in Society. Symbolic action and expressive culture among tribal, peasant, and industrial societies. Approaches emphasized are functionalism, symbolic interaction, structuralism, and cultural interpretation. One course. *Gaines, Pessar, or Weller*

267. Cognitive Anthropology. Culturally shared systems for categorizing, decision making, information processing, and performing other cognitive tasks. Prerequisite: Anthropology 165. One course. *Quinn*

275S. Inequality in Precapitalist Societies. The nature and transformation of political and economic power differentials with attention to differential power based on sex, age, or rank in social formations where property is corporately owned. One course. *Fox or Smith*

280S, 281S. Seminar in Selected Topics. Special topics in methodology, theory, or area. Prerequisite: consent of instructor. Two courses. *Staff*

282S. Canada. See Interdisciplinary Course 282S. Prerequisite: consent of Director of Undergraduate Studies. Counts for the major only with approval of Director of Undergraduate Studies. One course. *Leach and visitors*

COURSES CURRENTLY UNSCHEDULED

123. Peoples of the World: Mediterranean Europe

151. Culture and Thought

234S. Political Economy of Development: Theories of Change in the Third World

256. Topics in Psychological Anthropology

273S. Precapitalist Modes of Production and Exchange

274S. Inequality in Peripheral Capitalist Societies

ANTHROPOLOGY COURSES BY FIELDS OF CONCENTRATION

Anthropology courses for undergraduates are offered in three fields, as noted below. Students majoring in anthropology are expected by the time of their graduation to have completed a concentration in one of the three fields.

Social-Cultural Anthropology. Core courses: Anthropology 105, 119, 134, 137, 155, 165, 170. Courses on major world areas: Anthropology 120, 121, 122, 123, 124, 127, 128. More specialized courses: Anthropology 104, 107, 115, 116, 117, 118, 119, 130, 133, 135, 136, 145, 151, 164, 195, 196, 211, 234, 239, 251, 255, 256, 258, 267, 273, 274, 275, 280, 281, 282.

Physical Anthropology. Anthropology 132, 143, 144, 244, 246.

Archaeology. Anthropology 166, 167, 168, 241, 243.

THE MAJOR

The major in anthropology is offered under the Bachelor of Arts degree. *Major Requirements.* Eight courses in the department, two of which must be 93 and 94. Concentration in one of the three fields of the discipline must be accomplished by completing at least three courses designated for the chosen field. The remaining three courses may be selected from other departmental offerings,

either in the field of concentration or in other fields. Courses in each field of concentration are listed above, and the concentration requirements for each field follow:

Social-Cultural Anthropology Concentration. At least three courses distributed as follows: at least two courses from the core courses in social-cultural anthropology and at least one course from the list of courses dealing with the cultures and societies of a major world area.

Physical Anthropology Concentration. At least three courses selected from the offerings in physical anthropology, one of which must be 132.

Archaeology Concentration. At least three courses selected from the departmental offerings in archaeology, one of which must be 166.

Recommended Courses in Anthropology beyond Basic Requirements. Although an anthropology major consists of only eight required courses, students are encouraged to take additional courses both within their concentration and elsewhere in the department. The breadth of the discipline makes this desirable.

Suggested Work in Related Disciplines. Related courses in other departments are strongly advised. Each student's adviser will recommend a program of related work to complement the student's concentration and interests in anthropology.

Honors. Qualified majors are encouraged to participate in special work leading to graduation with distinction in anthropology. See the section on honors in this bulletin for general requirements. Any major with a *B+* average (3.3 gpa) in anthropology courses and with a *B* average (3.0 gpa) in all courses is eligible. Students who desire to undertake honors work should request a member of the anthropology faculty to recommend their names to the Director of Undergraduate Studies. To receive departmental honors a major must complete a paper involving significant independent research or scholarship and pass an oral examination on the paper conducted by an appointed committee of faculty members, at least two of whom should be in anthropology. Normally, students will prepare their papers over the course of the senior year working in close collaboration with their committees and receiving on the average two course credits in independent study for the work.

Arabic

For courses in Arabic, see Asian and African Languages.

Art (ART)

Professor Spencer, *Chairman*; Assistant Professor Bruzelius, *Director of Undergraduate Studies*; Associate Professors Goffen and Stars; Assistant Professors Epstein, Higdon, Pratt, and Shapiro; Professors Emeriti Markman and Sunderland; Instructor Smullin; Part-time Instructors Menapace, Roquet, and Smith; Part-time Lecturer van Dijk

HISTORY OF ART

Art history is intellectual history, providing students from all academic disciplines the opportunity to strengthen their powers of perception and expression and to bring together their various interests and different kinds of learning experiences. Art history is the study of works of art in their historical context, that is, in the context of their cultural, religious, philosophical, and sociological conceptions. Studying art history develops the ability to evaluate and organize different kinds of information and it enhances the faculties of creative imagination, precise observation, clear expression, and critical judgment. Students of art history acquire an appreciative awareness of great aesthetic achievements and a sense of our cultural heritage.

A major or second major in art history is the appropriate training for students interested in teaching art, or in working in galleries or museums, or in art publishing. Art history is also an excellent preparation for those planning careers in medicine, law, or other professions.

69, 70. Introduction to the History of Art. Artistic creations and the cultures they reflect. 69: from prehistory to the Renaissance (c. 1400). 70: from the Renaissance to the present. One course. *Staff*

125. Ancient Art. An introduction to the architecture, sculpture, and painting of ancient Greece and Rome from the Mycenaean Period through the sixth century A.D. One course. *Bruzelius*

127. Early Christian Culture: Evidence of Art and Literature. A consideration of major social and political developments from the third to fifth centuries in the Mediterranean basin through the detailed analysis of contemporary monuments and texts. C-L: Classical Studies 127 and Religion 127. One course. *Epstein and Gregg*

130. Early Medieval Art. Western European art and architecture from the seventh century through the eleventh. Works of Irish monasticism, the Carolingian Renaissance, and the Ottonian Empire. C-L: Medieval and Renaissance Studies. One course. *Epstein*

131. Byzantine Art and Architecture. Stylistic and structural developments in architecture, mosaics, frescoes, and icons in the Byzantine Empire from Iconoclasm to the Fall of Constantinople (ninth to fifteenth century), considered in their cultural context. C-L: Medieval and Renaissance Studies. One course. *Epstein*

132. Romanesque Art. Western European art and architecture from the mid-tenth through the twelfth centuries. Influence of monasticism, the Crusades, and pilgrimages on the arts. C-L: Medieval and Renaissance Studies. One course. *Bruzelius*

133. Gothic Art. Western European art and architecture of the High Middle Ages to the early fifteenth century. Emphasis on the French contribution to the development of Gothic style. C-L: Medieval and Renaissance Studies. One course. *Bruzelius*

134. Medieval Architecture. The development of medieval architecture through the mid-fourteenth century. Emphasis on churches, with discussion of castles and fortifications, town planning, and domestic architecture. C-L: Medieval and Renaissance Studies. One course. *Bruzelius*

135. Gothic Cathedrals. Major monuments of Gothic architecture in the twelfth and thirteenth centuries on the continent and in England with concentration on the great cathedrals of France. C-L: Medieval and Renaissance Studies. One course. *Bruzelius*

140. Giotto and the Origins of the Renaissance. Painting and sculpture in Italy, with emphasis on Pisano, Duccio, Giotto, and the crisis of the Black Death. C-L: Medieval and Renaissance Studies. One course. *Goffen*

141. Fifteenth-Century Italian Art. Painting, sculpture, and architecture from Masaccio, Donatello, and Brunelleschi to Leonardo. Emphasis on the art of Florence. C-L: Medieval and Renaissance Studies. One course. *Goffen or Spencer*

142. Sixteenth-Century Italian Art. Painting and sculpture in Rome and Florence: Michelangelo, Raphael, Leonardo. The rise and diffusion of mannerism: Pontormo to Tintoretto. C-L: Medieval and Renaissance Studies. One course. *Goffen or Spencer*

147. Venetian Art: Fifteenth Century to the Eighteenth Century. Painting, sculpture, and architecture with emphasis on Bellini, Giorgione, Titian, Tintoretto, Veronese, Palladio, and Tiepolo. C-L: Medieval and Renaissance Studies. One course. *Goffen*

148. Art of Northern Europe in the Fifteenth and Sixteenth Centuries. The "Northern Renaissance," with emphasis on the Netherlandish schools. C-L: Medieval and Renaissance Studies. One course. *Staff*

149. Death in Art. The theme of death from classical antiquity to the seventeenth century, with emphasis on medieval and Renaissance art and on the changing conceptions of death and of the individual. C-L: Medieval and Renaissance Studies. One course. *Goffen*

151. Italian Baroque Art. Seventeenth-century painting, sculpture, and architecture. One course. *Staff*

152. Northern Baroque Painting. Seventeenth-century Flemish and Dutch painting, with emphasis on the art of Rubens and Rembrandt. One course. *Staff*

153. Spanish Painting: El Greco to Goya. Survey from the sixteenth century through the first quarter of the nineteenth century. One course. *Staff*

161. Nineteenth-Century European Art. Painting and sculpture of leading artists within the movements of neoclassicism, romanticism, impressionism, and symbolism. One course. *Shapiro*

172. Nineteenth-Century American Art. The efforts of American artists to create a national style. Consideration will be given to both native and European influences on the most significant artists of this period. One course. *Shapiro*

173. Modern American Art. Art of the twentieth century in the Americas. Emphasis on the development of regional styles and the emergence of the United States in the vanguard of modernism. One course. *Higdon*

174. The History of Impressionism. The evolution of the impressionist movement and the works of its major masters. Particular attention will be paid to Monet, Degas, Cézanne, Pissarro, and Renoir. One course. *Shapiro*

175. Twentieth-Century Art. Modern art from 1900 to present. Emphasis on major movements, theoretical aims, and actual achievements. One course. *Higdon*

176. Surrealism. The surrealist movement that flourished in Paris between the World Wars; its origins, aims, and major adherents—such as the artists Miró, Magritte, Tanguy, and Dalí—examined in the context of surrealist literature, theory, and politics. One course. *Higdon*

177. Twentieth-Century Criticism. Twentieth-century art through the writings of its major proponents from Apollinaire and Roger Fry through Meyer Schapiro and Clement Greenberg to present-day theorists of postmodernism. The definition of modernism and the role of the critic as advocate, mediator, arbiter, and prophet of contemporary trends. One course. *Higdon*

178. History of Photography. The development of photography in Europe and America to the present; perceiving photographs as works of art and the stylistic development of major masters. C-L: Film. One course. *Shapiro*

179. Modern Architecture. Major movements in European and American architecture in the nineteenth and twentieth centuries with concentration on major architects and major buildings. Technical and theoretical bases; social and esthetic implications. One course. *Epstein*

191, 192. Independent Study. Directed reading and research. Open only to qualified students in the junior year, by consent of Director of Undergraduate Studies. Two courses. *Staff*

For Seniors and Graduates

220S. Greek Painting. Prerequisite: consent of instructor. C-L: Classical Studies 232S. One course. *Bruzelius or Stanley*

230S. Medieval and Byzantine Art and Architecture. Conceptual, institutional, or stylistic topics. Subject varies from year to year. Prerequisite: consent of instructor. C-L: Medieval and Renaissance Studies. One course. *Bruzelius or Epstein*

232S. Romanesque and Gothic Art and Architecture. Analysis of an individual topic. Subject varies from year to year. Prerequisite: consent of instructor. C-L: Medieval and Renaissance Studies. One course. *Bruzelius*

240. Italian Art. Examination of an individual artist, a particular movement, or the art of an Italian city. Subject varies from year to year. C-L: Medieval and Renaissance Studies. One course. *Goffen or Spencer*

242S. Studies in Italian Renaissance Art. Specific problems dealing with iconography, style, or an individual master from c. 1300 to 1600. Subject varies from year to year. Prerequisite: consent of instructor. C-L: Medieval and Renaissance Studies. One course. *Goffen or Spencer*

262S. Problems in Nineteenth-Century Art. One course. *Shapiro*

276S. Problems in Modern Art. Selected topics in modern art before 1945, with emphasis on major movements of masters. Prerequisite: consent of instructor. One course. *Higdon*

277S. Contemporary Art. Historical and critical principles applied to present-day artists and/or movements in all media since World War II. One course. *Higdon or Shapiro*

291, 292. Independent Study. Directed reading and research. Open only to qualified students in the senior year, by consent of Director of Undergraduate Studies. Two courses. *Staff*

293S. Methods in Art History. Approaches to the study of works of art, including connoisseurship, iconology, and stylistic analysis. Open to art majors, seniors, and qualified juniors only. One course. *Staff*

294, 295. Special Problems in Art History. Individual study and research. Two courses. *Staff*

DESIGN

To cover materials supplied in design courses, a fee of \$40 will be charged for each course, payable prior to the beginning of classes.

53. Drawing. Directed approaches to practice in life drawing and in the expression of graphic concepts. One course. *Roquet, Smith, Smullin, and Stars*

54. Two-Dimensional Design and Color. Experiments in form and color, with work from observation. Introduction to color theory in various media. Prerequisite: Art 53. One course. *Smith*

56. Three-Dimensional Design. An introduction to studio exploration of sculpture. Visual experience in an exploration of form: from point, line, and plane to space, mass, and time. Perceptual, structural, analytical, synthetic, and fantastic approaches. Prerequisite: Art 53. One course. *Smullin*

101, 102. Photography. Emphasis on interaction of technique, perception, and communication in making and responding to photographic images. Students must provide their own hand camera. Prerequisites: submission of portfolio and consent of instructor. C-L: Film. Two courses. *Menapace*

103, 104. Painting. Studio practice in painting with individual and group criticism and discussion of important historic or contemporary ideas. Prerequisites: Art 54 or equivalent and consent of instructor. Two courses. *Pratt*

105, 106. Advanced Drawing and Color. Work from life or in formal modes, with emphasis on personal development, through individual and group criticism and discussion. Prerequisites: Art 53 and 54 and consent of instructor. Two courses. *Pratt*

107, 108. Printmaking. Wood engraving, block printing, copperplate engraving, etching, aquatint, and drypoint. Prerequisite: Art 54 or consent of instructor. Two courses. *Roquet*

109. Figurative Sculpture. The human body in sculpture as subject and metaphor. Realistic modeling from the live model and working from imagination. Molding and casting techniques including lost wax metal casting. Prerequisites: Art 53 and 54 or 56 or 116 or consent of instructor. One course. *Smullin*

110. Sculpture. Studio practice in sculpture, emphasizing the central role of materials and processes in expression. Discussion and critiques will focus on the relationship of students' work to contemporary trends in sculpture. Prerequisites: Art 53 and 54 or 56 or 116 or consent of instructor. One course. *Smullin*

112. Ceramics. Design, production, and conceptualization of three-dimensional forms. Lectures and studio. One course. *Stars*

114. Old Master Techniques. Possibilities and limitations in a variety of media including fresco, egg tempera, silverpoint, and others. Prerequisites: Art 53 and 54 or consent of instructor. One course. *Stars*

116. Structure. Physical structure and its role in art, science, and technology. Lectures and laboratory/studio exercises in analysis, design, and creation of structure. C-L: Zoology 116 and Engineering 116. Does not count for distributional requirements. One course. *Pearsall, Smullin, and Wainwright*

180S. Design. Visual thinking and innovations in historical and contemporary art. Formal analysis and discussion of important issues for students involved in creating art. Prerequisites: two courses in design and consent of instructor. One course. *Pratt*

203, 204. Advanced Painting. Prerequisites: Art 53 and 54 and consent of instructor. Two courses. *Pratt*

209, 210. Advanced Sculpture. Studio concentration in a medium or theme chosen by the student. Class discussion will focus on effective communication of intention and relationship to present and past concerns in sculpture. Prerequisite: Art 109 or 110. Two courses. *Smullin*

217, 218. Individual Project. Independent work open to highly qualified seniors on recommendation of instructor and invitation of department. Two courses. *Staff*

ELECTIVE FOR ART MAJORS

119. Fine Arts Photography Laboratory. History and development of photography as documentation and art; use of materials, techniques, laboratory, and studio practice. Open only to art majors. A fee of \$25 will be charged, payable prior to beginning of classes. Half course. *van Dijk*

COURSES CURRENTLY UNSCHEDULED

- 50. Introduction to Design
- 126. Roman Art
- 143. Classical Tradition in the Renaissance
- 144. Central Italian Art
- 181. Pre-Columbian Art and Archaeology
- 182. Latin-American Art
- 183. Introduction to Japanese Art
- 253. Spanish Baroque Painting
- 279S. Problems in Modern Architecture
- 281S. Problems in Pre-Columbian Art and Archaeology
- 282S. Problems in Latin-American Art

THE MAJOR

The student will elect a sequence of courses emphasizing either the history of art or design. The department offers work leading to graduation with distinction. See the section on honors in this bulletin.

History of Art

Major Requirements. Eight courses in the history of art to include: one course from each of the following areas—ancient, medieval, Renaissance/baroque, and modern; Art 293S (to be taken fall term of the senior year, but juniors planning independent study should take the course in the junior year); one additional seminar at the 200 level. Two years of college level study or the equivalent in French, German, or Italian are strongly recommended. Majors contemplating graduate work in history of art are advised to take more than eight courses in history of art and to gain competence in French and German.

Design

Prerequisites. Art 69 or 70 and one other art history course; Art 53 and 54.
Major Requirements. Five studio courses exclusive of Art 53 and 54.

Institute of the Arts (AI)

Associate Professor Applewhite (English), *Director*. *Fellows:* Professors Bone (music), Bryan (music), Douglass (music), Hanks (music), Price (English), Spencer (art), R. Ward (music), and Withers (music); Associate Professors Clum (drama), Stars (art), B. Ward (philosophy), and Wray (dance); Assistant Professors Henry (music), Jaffe (music), Kremen (psychology), and V. Pratt (art); Instructor Smullin (art); Lecturers Smith (music) and Storer (drama); Artists-in-Residence Ciompi (music) and Desmond (dance); Artist Associates Raimi (music) and Taylor (music); Director of Cultural Affairs E. Pratt; Staff Associate Marshall (music); Scene Designer and Technical Director Judd; Costume Designer Wesp

The Institute of the Arts, established in 1981, coordinates activities in the performing and creative arts, thus encouraging the interrelationship of programs in dance, drama, film, imaginative writing, musical performance and composition, and studio art. Advisers for interdepartmental concentrations and for Program II proposals are offered by the institute. All performing and creative artists are fellows, whether regular faculty members or distinguished artists in residence. The

institute assembles representatives of the various artistic disciplines into a single body for the planning of interdisciplinary courses, yearly themes, and special events. A perception of the continuity among the arts is thus encouraged. Courses and festivals sponsored by the institute bring together different art forms, integrating aesthetic appreciation with historical study and critical analysis. Student awards, honors projects, performances, and exhibitions are sponsored. The institute also offers Arts in New York, a one-semester residency program. It provides academic and professional experiences to selected juniors and seniors interested in studying the arts.

Courses offered in art design, dance, drama, film, imaginative writing, musical performance and composition, and interdisciplinary courses in the arts are listed below. Those in art design, imaginative writing, and musical performance and composition are described more fully under the Departments of Art, English, and Music, respectively.

Students may major in art design, drama, English with an emphasis on writing, or in music. Combined majors may be formed according to the rules of the interdepartmental concentration. The major in drama is described below; the majors in art, English (writing), and music are described under the appropriate departments.

Students seeking further information on the Institute of the Arts should consult Professor Applewhite, Institute of the Arts, 120 East Duke Building; (919) 684-6654.

DANCE (DAN)

Associate Professor Wray, *Coordinator of the Dance Program*; Part-time Instructors Blair and Dorrance; Artist-in-Residence Desmond

Activity and theory courses are offered for undergraduate men and women who have special interest in dance as an art form. Although no major in dance exists, Program II provides the possibility of interdisciplinary study of dance in relation to other art forms. Summer courses are available through the American Dance Festival.

Activity Courses

60. **Beginning Modern Dance I.** Modern dance as an art form: techniques, choreography, history, philosophy, and aesthetics. Half course. *Blair*

61. **Beginning Modern Dance II.** Prerequisite: Dance 60. Half course. *Blair*

62. **Intermediate Modern Dance I.** Prerequisite: Dance 61. Half course. *Desmond*

63. **Intermediate Modern Dance II.** Prerequisite: Dance 62. Half course. *Desmond*

64. **Advanced Modern Dance.** Prerequisite: Dance 63. Half course. *Desmond*

65. **Beginning Improvisation.** Prerequisite: Dance 61. Half course. *Desmond*

70. **Ballet I.** Prerequisite: one year of training in the strict classical form. Half course. *Dorrance*

71. **Ballet II.** Prerequisites: two years of ballet and consent of instructor. Half course. *Dorrance*

80. **Individual Dance Program.** Half course. *Staff*

Theory Courses

131S, 132S. **History of Dance.** Emphasis on form, structure, and content related to culture of eras. Two courses. *Wray*

134. Creative Movement for Children. Theory and experience for grades K-12. Recommended for those interested in dance, music, recreation, or elementary and secondary teaching. One course. *Wray*

135, 136. Principles of Contemporary Dance Composition. Prerequisites: Dance 60, 61, and 62 or consent of instructor. Two courses. *Desmond*

191, 192. Independent Study. Two courses. *Staff*

198. Sacred Dance. One course. *Wray*

Courses Currently Unscheduled

139. Movement Connotations

197. Aesthetics of Twentieth-Century Dance

DRAMA (DRA)

Associate Professor Clum (English), *Director of the Program in Drama* and *Chairman of the Interdisciplinary Committee on Drama*; Professors Cordle (French), Krynski (Slavic languages), and Wardropper (Spanish); Associate Professors Alt (German), Burian (classical studies), Jezierski (Slavic languages), and Stewart (Romance languages); Lecturer Storer; Visiting Lecturer Azenberg; Scene Designer/Technical Director Judd; Costume Designer Wesp

Practical Theater

91. Introduction to Theater Arts. Acting, directing, design, criticism, administration, theater as a profession. One course. *Staff*

101. Acting. Basic acting skills; diction, movement, improvisation, interpretation. Prerequisite: consent of instructor. One course. *Clum or Storer*

102. Advanced Acting. Advanced work in interpretation and scene study. Prerequisite: Drama 101. One course. *Clum or Storer*

107S. Advanced Scene Study. Research into historical, psychological, and technical interpretation. Prerequisites: Drama 101 and 102. One course. *Clum or Storer*

109. Television Workshop. Acting and directing. Videotaping of television dramas. Taught by a professional actor-director. One course. *Staff*

111. Directing. Basic training in casting, blocking, and interpretation. Prerequisite: Drama 101. One course. *Storer*

112S. Playwriting. Techniques of writing for the stage and screen. Prerequisite: consent of instructor. One course. *Clum*

121. Stagecraft. An introduction to the technical aspects of play production. Laboratory work coordinated with productions of Duke Players and Summer Theatre at Duke. One course. *Judd*

122. Scenic Design. Prerequisite: Drama 121. One course. *Judd*

123, 124. Costume Design. 123: elements of design and their application to character analysis. Emphasis on basic drawing and rendering techniques. 124: historical and contemporary design. Emphasis on rendering a variety of styles. Laboratory work coordinated with Duke Players productions. Prerequisite for 124: Drama 123. Two courses. *Wesp*

125. Stage Makeup. Theories and techniques of makeup application; fundamentals and historical styles of makeup design. One course. *Wesp*

127. Lighting Technology. History, electrical theory, instrumentation, and the drafting of lighting plots. Laboratory work coordinated with the productions of Duke Players or Summer Theatre at Duke. One course. *Judd*

131S. Theater Administration. Practical aspects of management: budgets, personnel organization, fund raising, repertory, publicity. One course. *Staff*

171. Special Topics in Practical Theater. Makeup, mime, movement, etc. Half course. *Staff*

181S. Conference on Special Topics. Variable credit. *Staff*

191-194. Independent Study. Intensive study or special projects in theater history or practical theater approved by the Committee on Drama. One course. *Staff*

Dramatic Literature

64. The Drama. C-L: Classical Studies 64. One course. *Burian*

81. Introduction to Film. Basic principles of film and film criticism through the study of works by Lumière, Méliès, Griffith, Hitchcock, Renoir, Bergman, and others. C-L: English 81 and Film. One course. *Clum or Gaines*

82. The American Film. A survey history focusing on the work of major directors and examples of important genres. C-L: English 82 and Film. One course. *Clum or Gaines*

141, 142. Shakespeare. C-L: English 143, 144. Two courses. *DeNeef, Jones, or G. Williams*

143. Western Drama, Classical to Neoclassical. C-L: English 182. One course. *Clum*

144. Western Drama from 1800 to 1914. C-L: English 183. One course. *Bernstein or Clum*

145. Modern Continental Drama. C-L: English 184. One course. *Bernstein or Clum*

146. Twentieth-Century American Drama. C-L: English 162. One course. *Bernstein or Clum*

148. Modern British Drama. C-L: English 133. One course. *Bernstein or Clum*

152. French Comedy. C-L: French 151. One course. *Stewart*

154S. French Drama of the Twentieth Century. C-L: French 162S. One course. *Cordle*

165. Introduction to the World of Chekhov. C-L: Russian 177. One course. *Jezierski and Krynski*

172. The Musical Theater. C-L: Music 142. One course. *Ward*

188. Literature and the Film. C-L: English 188 and Film. One course. *Staff*

Courses Currently Unscheduled

128. Lighting Design

151. Theory and Form of Tragedy

155S. Drama

163. Slavic Drama and Theater of the Twentieth Century

The Major

Prerequisite. Drama 91.

Major Requirements. Drama 101 and 121 plus at least two additional courses in practical theater from the offerings of the drama program. Drama 143, plus at least three additional courses at the 100 level from the offerings in dramatic literature, drama criticism, or film.

FILM

Assistant Professor Hedges, *Chairman of the Committee on the Study of Film*

The courses are described in the listings of the specified departments.

Art

- 101, 102. Photography. *Menapace*
- 178. History of Photography. *Shapiro*

Comparative Literature

- 130. Literature and Film. *Hedges*
- 132. Dada and Surrealism. *Hedges*
- 177. Film Theory. *Gaines*
- 185. Psychoanalysis, Literature, and Film. *Hedges and Werman*

English

- 81. Introduction to Film. *Staff*
- 82. The American Film. *Clum*
- 188. Literature and the Film. *Staff*
- 189S. Special Topics in Film. *Staff*

French

- 122. French Film. Taught in English. *Hedges*
- 170. Film and the French Novel. Taught in French. *Hedges*

History

- 127S. History and the Visual Image. *Wood*

Philosophy

- 121. Philosophy and Film. *Wartenberg*

Political Science

- 153, 154. Politics and the Media of Mass Communication. *Paletz*

Public Policy Studies

- 176S. American Communities: A Photographic Approach. *Harris*
- 178. Visual Language and Policy Choice. *Harris or Payne*
- 182S. Production of Television News and Documentaries. *Ho*

Romance Languages

- 150. Authorship in the Cinema: Luis Buñuel. *Hedges*

Sociology

- 170. Mass Communication. *Smith*

INTERDISCIPLINARY COURSES

170. Romanticism in the Arts. The literary, visual, and musical arts of the nineteenth century examined in their historical and theoretical context. Manifestations in the works of Goethe, Wordsworth, Balzac; Friedrich, Delecroix, Turner; Beethoven, Schumann, Berlioz; and others. Developments and continuities in sensibility and style. Guest lecturers, coordinated performances. Counts toward the distributional requirements in humanities. One course. *Applewhite or B. Ward*

181S. Art and Its Making. An inquiry into the artistic process from a conceptual survey of dominant views to direct interviewing of and discussion with

artists. Prerequisites: junior or senior standing and consent of instructor. C-L: Psychology 181S. One course. *Kremen*

Courses in the creative and performing arts are also offered by the Department of Art, the Department of English (imaginative writing), and the Department of Music. These courses are cited below and are described fully under the appropriate department.

ART DESIGN (Department of Art)

Professor Spencer; Associate Professor Stars; Assistant Professor Pratt; Instructor Smullin; Part-time Instructors Menapace, Roquet, and Smith; Part-time Lecturer van Dijk

- 53. Drawing. *Roquet, Smith, Smullin, and Stars*
- 54. Two-Dimensional Design and Color. *Smith*
- 56. Three-Dimensional Design. *Smullin*
- 101, 102. Photography. *Menapace*
- 103, 104. Painting. *Pratt*
- 105, 106. Advanced Drawing and Color. *Pratt*
- 107, 108. Printmaking. *Roquet*
- 109. Figurative Sculpture. *Smullin*
- 110. Sculpture. *Smullin*
- 112. Ceramics. *Stars*
- 114. Old Master Techniques. *Stars*
- 116. Structure. *Pearsall, Smullin, and Wainwright*
- 119. Fine Arts Photography Laboratory. Elective for art majors. *van Dijk*
- 180S. Design. *Pratt*
- 203, 204. Advanced Painting. *Pratt*
- 209, 210. Advanced Sculpture. *Smullin*
- 217, 218. Individual Project. *Staff*

Courses Currently Unscheduled

- 50. Introduction to Design

The Major

The major in Art Design is described under the Department of Art.

IMAGINATIVE WRITING (Department of English)

Professor Price; Associate Professor Applewhite; Assistant Professors Pope and Porter

- 2. The Art of Expository Writing. *Staff*
- 28S. Introduction to Creative Writing. *Staff*
- 61S. Writing: Prose Fiction and Drama. *Staff*
- 62S. Writing: Poetry. *Staff*
- 101S. Advanced Expository Writing. *Staff*
- 103S, 104S. Writing: Short Stories. *Applewhite, Pope, or Price*
- 105S. Writing: Longer Prose Narrative. *Price*
- 106S. The Writing of Poetry. *Applewhite*
- 107S. Writing: Drama. *Staff*
- 109S. Special Topics in Writing. *Staff*

The Major

The major in English with an emphasis on writing is described under the Department of English.

MUSIC PERFORMANCE AND COMPOSITION (Department of Music)

Professors Bone, Bryan, Douglass, Hanks, Kirkendale, R. Ward, and Withers; Associate Professors Seebass and Todd; Assistant Professors Bartlet, Herlinger, and Jaffe; Artist-in-Residence Ciompi; Lecturers Love and Smith; Artist Associates

Bloom, Raimi, and Taylor; Staff Associates Cabbage, Gilmore, Gress, Hawkins, Johnston, Lail, Marshall, Mizesko, Myers, Peck, Pederson, Ruggero, Thompson, Troxler, and Weddle

Theory and Composition

- 55, 56. Introduction to Music Theory. *Staff*
- 65. Fundamentals of Music Theory. *Douglass, Herlinger, Jaffe, or Todd*
- 66. Tonal Harmony. *Douglass, Herlinger, Jaffe, or Todd*
- 67S, 68S. Composition I. *Jaffe*
- 115S. Modal Counterpoint. *Herlinger or Todd*
- 116S. Tonal Counterpoint. *Herlinger or Todd*
- 117S, 118S. Analysis I and II. *Herlinger or Todd*
- 122. Orchestration. *Bryan*
- 130T, 131T. Performance Practice (Organ) I, II. *Douglass*
- 132T, 133T. Performance Practice (Organ) III, IV. *Douglass*

Literature

- 74. Introduction to Jazz. *Staff*
- 119. The Humanities and Music. *Bartlett, Kirkendale, or Seebass*

Independent Study and Seminars

Admission to these courses is subject to the approval of the Director of Undergraduate Studies in music and the instructor. The instructor and course content will be established in accordance with the individual student's interests and capacities.

- 179, 180. Independent Study in Musical Performance. *Staff*
- 181, 182. Independent Study in Musical Performance. *Staff*
- 183, 184. Independent Study in Musical Performance. *Staff*

Music Education and Pedagogy

- 57S, 58S, 59S, 60S. Vocal Diction. *Hanks*
- 128. Instrumental Conducting. *Bone*
- 129. Choral Conducting. *Smith*

Applied Music

Instruction: half hour, quarter course credit

- 79. Class Voice. *Staff*
- 80. Piano. *Hawkins, Love, Ruggero, or Withers*
- 81. Strings. *Bloom, Ciampi, Cabbage, Taylor, or Raimi*
- 82. Woodwinds. *Gilmore, Henry, Pederson, Troxler, or Weddle*
- 83. Brass. *Bryan, Gress, Mizesko, or Meyers*
- 85. Voice. *Hanks, Lail, or Peck*
- 86. Organ. *Douglass or Marshall*
- 87. Harpsicord. *Marshall*

Instruction: 1 hour, half course credit

- 90. Piano. *Hawkins, Love, Ruggero, or Withers*
- 91. Strings. *Bloom, Ciampi, Cabbage, Taylor, or Raimi*
- 92. Woodwinds. *Gilmore, Henry, Pederson, Troxler, or Weddle*
- 93. Brass. *Bryan, Gress, Mizesko, or Meyers*
- 95. Voice. *Hanks, Lail, or Peck*
- 96. Organ. *Douglass or Marshall*
- 97. Harpsicord. *Marshall*

Ensemble Classes: quarter course credit; pass/fail

- 100. Symphony Orchestra. *Bone*
- 101. Wind Symphony. *Bryan*
- 102. Marching Band. *Henry*
- 104. String Ensemble. *Staff*
- 110. Collegium Musicum. *Herlinger*
- 111. Opera Workshop. *Hanks*
- 112. Chapel Choir. *Smith*
- 113. Chorale. *Smith*

Courses Currently Unscheduled

- 84. Percussion
- 94. Percussion

The Major

The major in music is described under the Department of Music.

Asian and African Languages

Major programs are not offered in Asian and African languages. Interested students are encouraged, however, to consider the major in comparative area studies.

ARABIC (ARB)

1, 2. **Elementary Arabic.** Understanding, speaking, reading, and writing Arabic. Language laboratory. Two courses. *Cooke*

11. **Intensive Elementary Arabic I.** Instruction for a period of two weeks. Eligibility for Arabic 12, 13, or 14 requires study independently throughout the year following completion of Arabic 11. No prerequisites. Pass/fail. Half course. *Cooke*

12. **Intensive Elementary Arabic II.** Instruction for a period of two weeks. Eligibility for Arabic 13 or 14 requires study independently throughout the year following completion of Arabic 12. Prerequisite: consent of instructor. Pass/fail. Half course. *Cooke*

13. **Intensive Elementary Arabic III.** Instruction for a period of two weeks. Eligibility for Arabic 14 requires study independently throughout the year following completion of Arabic 13. Prerequisite: consent of instructor. Pass/fail. Half course. *Cooke*

14. **Intensive Elementary Arabic IV.** Instruction for a period of two weeks. Prerequisite: consent of instructor. Pass/fail. Half course. *Cooke*

63, 64. **Intermediate Arabic.** Concentration on written and spoken language. Two courses. *Cooke*

171S. **Modern Arabic Literature in Translation.** Taught in English. C-L: Comparative Area Studies. One course. *Cooke*

Courses Currently Unscheduled

173S. **Women in Arabic Literature**

CHINESE (CHN)

1, 2. **Elementary Chinese.** Introduction to speaking, understanding, reading, and writing modern standard Chinese (Mandarin, or *putonghua*, based on the Beijing dialect). Two courses. *Kunst*

63, 64. **Intermediate Chinese.** Reading, oral practice, language laboratory. Two courses. *Kunst*

135, 136. **Introduction to Modern Chinese Literature.** Prerequisite: Chinese 64 or equivalent. C-L: Comparative Area Studies. Two courses. *Kunst*

191, 192. **Independent Study.** Two courses. *Kunst*

193. **Directed Study.** Reading and research related to a course audited in a department of Nanjing University and culminating in a paper on a topic approved and supervised by the resident director. One course. *Dirlik*

Courses Currently Unscheduled

125, 126. **Advanced Chinese**

127. **Chinese Conversation and Composition**

129. **Advanced Readings in Chinese**

141. **Chinese Literature in Translation**

HINDI-URDU (HIN)

1, 2. Intensive Elementary Hindi-Urdu. Conversation, basic grammar, and vocabulary; introduction to the Devanagari script and the reading of graded texts. Four hours of classroom work; two hours of language laboratory drill. Two courses. *Siddiqi*

63, 64. Intensive Intermediate Hindi-Urdu. Reading, composition, and conversation. Four hours of classroom work, two hours of language drill. Prerequisite: Hindi-Urdu 1, 2. Two courses. *Siddiqi*

JAPANESE (JAP)

1, 2. Elementary Japanese. Introduction to speaking, understanding, reading, and writing. Two courses. *Fowler*

63, 64. Intermediate Japanese. Classroom and language laboratory practice on spoken and written patterns; reading and discussion. Two courses. *Fowler*

155, 156. Readings in Modern Japanese. C-L: Comparative Area Studies. Two courses. *Fowler*

161. Modern Japanese Fiction in Translation. One course. *Fowler*

PERSIAN (PER)

1, 2. Elementary Persian. Introduction to spoken and literary Persian: understanding, speaking, reading, and writing. Language laboratory drill. Two courses. *Siddiqi*

63, 64. Intensive Intermediate Persian. Four hours of classroom work; two hours of language laboratory drill. Advanced conversation in Iranian Persian, reading, and composition. Prerequisite: elementary Persian. Two courses. *Siddiqi*

SWAHILI (SWA)

1, 2. Elementary Swahili. Language instruction through self-instructional mode. Intensive work in language laboratory; drill sessions with native speakers. Two courses. *Staff*

63, 64. Intermediate Swahili. Classroom work and language laboratory drill. An advanced study of language and Swahili culture and literature. Two courses. *Staff*

Astronomy

For courses in astronomy, see Physics.

Biology (BIO)

The introductory biology courses and the biology major are cooperatively administered by the Department of Botany and the Department of Zoology. Additional courses in biosciences are offered by the Departments of Botany and Zoology, and also by the Departments of Anthropology, Chemistry, and Psychology in Trinity College of Arts and Sciences; by the Departments of Anatomy, Biochemistry, Microbiology and Immunology, and Physiology in the School of Medicine; and by the Schools of Engineering and Forestry and Environmental Studies.

10L. Marine Biology. Physical and chemical characteristics of marine ecosystems and the functional adaptations of marine organisms to these systems. Lectures, field trips, and laboratories. For students not majoring in a natural science. Given at Beaufort. One course. *Staff*

14L. Principles of Biology. A one-semester introduction. Lectures and laboratories. One course. *Staff*

Biology 14L is a prerequisite to most courses in botany and zoology. Both Biology 10L and Biology 14L may count for the distributional requirements and for the requirement in empirical science.

THE MAJOR

The Bachelor of Arts and the Bachelor of Science degrees are offered with a major in biology, in botany, in zoology, or in an individually designed interdepartmental concentration approved by the appropriate Director of Undergraduate Studies. The Director of Undergraduate Studies for the biology major is alternately the Director of Undergraduate Studies in botany or zoology.

The Handbook for Biology Majors may be obtained from the office of the Director of Undergraduate Studies for the biology major. For descriptions of courses appropriate for the biology major see courses listed in this bulletin under the Departments of Botany and Zoology and related departments.

For the A.B. Degree

This degree program is the general liberal arts major program. Preprofessional students should elect the degree program leading to the B.S. degree.

Prerequisite. Biology 14L or equivalent.

Corequisites. Botany 145L or 144L; Zoology 74L; Chemistry 11, 12; and Mathematics 31.

Major Requirements. A minimum of six courses in the biosciences, not including the above prerequisite and corequisites. The six courses must include one course from three of the following four areas in the Departments of Botany or Zoology: cell biology, genetics, plant or animal ecology, plant or animal physiology. The remaining three courses may be elected from among courses numbered 100 or above in botany, zoology, or in the basic science departments in the School of Medicine, or from approved courses of a basic biological character in related departments.

For the B.S. Degree

This is the preprofessional program in biology.

Prerequisite. Biology 14L or equivalent.

Corequisites. Botany 145L or 144L; Zoology 74L; Chemistry 11, 12 and 151; Mathematics 31, 32, or 34; Physics 51, 52; Biochemistry 227 or Chemistry 175.

Major Requirements. A minimum of six courses in the biosciences, not including the prerequisite and corequisites, as specified for the A.B. degree, except that at least one of the courses must be at the 200 level. At least one semester of independent study is recommended.

For Departmental Majors and Interdepartmental Concentrations

See major requirements under Botany and Zoology for botany majors and zoology majors, respectively. For an individually designed interdepartmental concentration (e.g., in cell and molecular biology, physical biology, marine biology) see the Directors of Undergraduate Studies who can help arrange for such programs. See major requirements under Chemistry for a specialization in biological chemistry.

Honors

The botany and zoology departments offer a program for graduation with distinction in biology. See the section on honors in this bulletin. Students interested in pursuing an honors program should consult the Director of Undergraduate Studies for the biology major.

Botany (BOT)

Professor White, *Chairman*; Associate Professor Christensen, *Director of Undergraduate Studies*; Professors Antonovics, Barber, Boynton, W. Culberson, Hellmers, Johnson, Naylor, Philpott, Stone, Strain, and Wilbur; Associate Professors Knoerr, Ramus, Searles, and Siedow; Assistant Professor Schlesinger; Professors Emeriti Anderson, Billings, Kramer, and Perry; Adjunct Professor C. Culberson; Adjunct Assistant Professor Patterson

The introductory course is Principles of Biology. It is listed under Biology in this bulletin.

43. Ecology and Society. Ecological concepts and their application to human society. Intended for students interested primarily in social sciences and humanities. One course. *White and staff*

51L. Culture and Propagation of Plants. Principles of physiology, genetics, ecology, and taxonomy as applied to horticulture. Lectures, greenhouse and garden work, and field trips. Prerequisite: introductory college biology. One course. *W. Culberson*

53. Introductory Oceanography. Basic principles of physical, chemical, biological, and geological oceanography. Prerequisite: one course in a laboratory science. C-L: Geology 53. One course. *Pilkey and Searles*

75. Plants of the Southeast. Survey of the flora, stressing biological and geological factors related to present-day floristic and evolutionary patterns. One course. *Stone*

90. Plants and Man. The coevolution of agriculture and civilization; the invention of elite races of domesticated plants from wild species by artificial selection. The economic botany of the world's major crops. One course. *C. Culberson and W. Culberson, or Naylor*

92. Trees and Shrubs of North Carolina. Identification and natural history of the trees, shrubs, and woody vines. Emphasis on those cultivated and occurring naturally in North Carolina. One course. *Wilbur*

103L. General Microbiology. Classical and modern principles of the structure, physiology, and genetics of microorganisms and their roles in human affairs. Prerequisite: one course in a biological science or consent of instructor. C-L: Microbiology 103L. One course. *Johnson and Wheat*

115L. Phytoplankton. Taxonomy, physiology, and community ecology of these life forms and their role in the biology of the seas. Laboratory and field exercises emphasize techniques of the biological oceanographer. Prerequisite: introductory biology. Given at Beaufort. One course. *Ramus*

142L. Plant Systematics. Surveys major groups. Principles of vascular plant taxonomy with practice in identification of local flora. Lectures, laboratories, and field trips. One course. *Wilbur*

144L. Diversity of Plants. Surveys major groups of living plants with emphasis on algae, bryophytes, and vascular plants. Field observations and collections stress coastal botany and provide a basis for independent projects. Not

open to students who have had Botany 145L. Prerequisite: introductory biology. Given at Beaufort. One and one-half courses. *Staff*

145L. Plant Diversity. Major groups of the living plants, their evolutionary origins and phylogenetic relationships. Prerequisite: introductory biology. C-L: Botany 245L. One course. *White or Searles and Wilbur*

146L. Ecology of Plants. Principles of the relationships between plants and their environments. Structures and processes of ecosystems. Laboratory, lectures, and field trips. Prerequisites: introductory biology and one other course in biology. C-L: Botany 246L. One course. *Christensen, Schlesinger, or Strain*

147L. Plant Ecology. Principles of the relationships between plants and their environments. Emphasis on structures and processes of coastal plain ecosystems. Not open to students who have had Botany 146L. Prerequisite: introductory biology. Given at Beaufort. One and one-half courses. *Christensen*

151L. Plant Physiology. Principal physiological processes of plants, including respiration, photosynthesis, water relations, and factors associated with plant morphogenesis. Prerequisites: introductory biology and one year of chemistry; organic chemistry is desirable. C-L: Botany 251L. One course. *Siedow*

160L. Plant Anatomy. A comparative study of basic cell types, tissues, and organs of vascular plants. Correlation of anatomical information with pertinent literature, application of anatomy to problems in systematics and evolution, and the interrelationship between structure and function. Prerequisite: plant diversity or consent of instructor. C-L: Botany 260L. One course. *White*

167. Analysis of Marine Ecosystems. Major marine ecosystems, the physical and biological characteristics of each as a functional entity. Lectures and discussion. Prerequisites: Biology 14L and Chemistry 12. C-L: Zoology 167. Given at Beaufort. One course. *Barber*

180. Principles of Genetics. Structure and properties of genes and chromosomes in individual organisms and in populations. Prerequisites: introductory biology and Chemistry 12 and Mathematics 31 or equivalents. C-L: Botany 280, Zoology 180, Zoology 280, and University Program in Genetics. One course. *Antonovics, Boynton, and Gillham*

191, 192. Independent Study. Directed reading and research. Open to qualified students in the junior and senior years by consent of department. C-L: Marine Sciences. Credit to be arranged. *Staff*

193T, 194T. Tutorial in Botany. Credit to be arranged. *Staff*

195S.04. Light in the Sea. Properties of light in the sea and the biological consequences; orientation, bioluminescence, biological rhythms, primary production, and sensing devices. Given at Beaufort. Half course. *Ramus*

195S, 196S. Seminar in Botany. Credits to be arranged. *Staff*

For Seniors and Graduates

209L. Lichenology. Morphology, systematics, and biological and ecological implications of the lichens. Collection and identification of specimens and the use of lichen chemistry in taxonomy. One course. *C. Culberson and W. Culberson*

212L. Phycology. Morphological and ecological characteristics of common freshwater and marine algae and principles of their classification. One course. *Searles*

215L. Primary Productivity in the Seas. The biological flux of carbon in the coastal and open seas involving phytoplankton, seaweeds, seagrasses, and marsh-

grasses. The contributions of these primary producers to food chain processes and global atmospheric-sedimentary cycles, as well as the ecological consequences of variations in photosynthetic mechanisms. Prerequisites: introductory biology and introductory chemistry. C-L: Zoology 215L. Given at Beaufort. One course. *Barber and Ramus*

218. Barrier Island Ecology. Adaptation of plants to barrier island migration and other physical characteristics of the coastal environment. Major emphasis will be placed on management of barrier beaches from Maine to Texas and the impact of human interference with natural processes. Field studies. Prerequisite: a course in general ecology. Given at Beaufort. One and one-half courses. *Staff*

219L. Benthic Marine Algae. Morphology, reproduction, life histories, systematics, and natural history of seaweeds. Lectures, laboratories, and field work in ocean and estuaries. Prerequisite: introductory biology; plant diversity recommended. Given at Beaufort. One course. *Searles*

221L. Mycology. Field and laboratory study of vegetative and reproductive structures of the fungi and slime molds. Methods of collection, isolation, propagation, and identification of the major orders as represented in local flora. Prerequisite: one year of biological science. One course. *Johnson*

225T, 226T. Special Problems. Students with adequate training may do special work in the fields listed below. Credit to be arranged.

1. Cytology; Bryology. *Staff*
2. Genetics. *Antonovics*
4. Phycology. *Ramus*
5. Genetics. *Boynton*
6. Ecology. *Christensen*
7. Lichenology. *W. Culbertson*
9. Bacteriology; Mycology. *Johnson*
10. Physiology. *Naylor*
12. Phycology. *Searles*
13. Systematics of Flowering Plants. *Stone*
14. Ecology. *Strain*
15. Anatomy and Morphology of Vascular Plants. *White*
16. Systematics and Taxonomy of Vascular Plants. *Wilbur*
17. Physiology. *Siedow*
18. Biological Oceanography. *Barber*
19. Ecology. *Schlesinger*

227. Introductory Biochemistry I: Intermediary Metabolism. Chemistry of the constituents of proteins, lipids, carbohydrates, and nucleic acids and their metabolic interrelationships. Prerequisite: organic chemistry. C-L: Biochemistry 227. One course. *Fridovich and Rajagopalan*

228. Introductory Biochemistry II: Biological Macromolecules. Prerequisite: Biochemistry 227 or equivalent. C-L: Biochemistry 228. One course. *Greenleaf and Webster*

232. Microclimatology. C-L: Forestry and Environmental Studies 232. One course. *Knoerr*

243S. Classification of Angiosperms. The characteristics and phylogenetic relationships of large and important families of angiosperms with emphasis upon the systems of Cronquist and Thorne. Prerequisite: Botany 142L or equivalent. One course. *Wilbur*

250L,S. Plant Biosystematics. Descriptive and experimental procedures used to assess systematic implications of vascular plant evolution. Laboratory, discussion, and field-oriented problems. Prerequisites: basic courses in systematics and genetics. One course. *Stone*

253. Biophysical Plant Physiology. Application of physical principles to such processes as ion transport, water relations, and the interconversion of energy in plant cells. Prerequisites: Botany 151L and Mathematics 32 or equivalent. One course. *Siedow*

258. Physiology of Growth and Development. Consideration of the internal factors and processes leading to the production of new protoplasm and its differentiation at the cellular, tissue, and organ level in plants. Lectures. Prerequisite: Botany 151L or equivalent; organic chemistry recommended. One course. *Naylor*

261. Photosynthesis. Principles of photosynthesis: developmental, mechanistic, regulatory, and ecological aspects of the photosynthetic process. Prerequisite: Botany 151L or 251L. One course. *Siedow*

263L. Tropical Seaweeds. Collection, preservation, description, identification, illustration, and descriptive ecology. Two-week field study on Andros Island in the Bahamas. Prerequisite: Botany 145L or equivalent or consent of instructor. Half course. *Searles*

265. Physiological Plant Ecology. The physiological approach to interpreting adaptation in plants, with emphasis on terrestrial seed plants. Prerequisites: Botany 146L and 151L or equivalents. One course. *Strain*

265L. Physiological Plant Ecology. See Botany 265. Lectures and laboratories. One course. *Strain*

267L. Plant Community Ecology. Concepts and methods of plant synecology. Introduction to the plant communities of North Carolina. Prerequisites: Botany 142L and 146L or equivalents and consent of instructor. One course. *Christensen*

268. Molecular Biology II: Nucleic Acids. Structure and metabolism of nucleic acids in the context of their biological function in information transfer. Prerequisites: introductory biochemistry and Biochemistry 259 or consent of instructor. C-L: Biochemistry 268 and Microbiology 268. One course. *Modrich and staff*

269. Advanced Cell Biology. Structural and functional organization of cells and their components with emphasis on current research problems and prospects. Prerequisite: introductory cell biology or consent of instructor. C-L: Anatomy 269, Microbiology 269, and Zoology 269. One course. *Nicklas and staff*

272. Ecosystem Analysis. Current problems and progress in studies of terrestrial systems and the biosphere, including energy flow and mineral cycling processes. Prerequisite: Botany 146L. One course. *Schlesinger*

283. Extrachromosomal Inheritance. Genetics, biochemistry, and molecular biology of the organelles of eukaryotic cells, bacterial plasmids and episomes, and cellular symbionts. Emphasis on recent literature. Prerequisite: introductory genetics. C-L: Zoology 283 and University Program in Genetics. One course. *Boynton or Gillham*

285S. Ecological Genetics. Interaction of genetics and ecology and its importance in explaining the evolution, diversity, and distribution of plants and animals. Prerequisites: Botany 180 and 286 or equivalents. C-L: University Program in Genetics. One course. *Antonovics*

286. Evolutionary Mechanisms. Population ecology and population genetics of plants and animals. Fitness concepts, life history evolution, mating systems, genetic divergence, and causes and maintenance of genetic diversity. Prerequisite: genetics. C-L: Zoology 286 and University Program in Genetics. One course. *Antonovics and H. Wilbur*

293L. Population Biology. Theoretical approach to population genetics, life table mathematics, life cycle evolution in plants and animals, population dynamics, and regulation. Laboratories emphasize experimental methods. Individual projects and weekend field trips. Prerequisites: calculus and ecology and consent of instructor. C-L: Zoology 293L. One course. *Antonovics and H. Wilbur*

295S, 296S. Seminar. Credit to be arranged. *Staff*

COURSES CURRENTLY UNSCHEDULED

204L. Marine Microbiology

210L. Bryology

MARINE LABORATORY

Botany 144L, 147L, 191, 192, 204L, 215L, 218, and 219L are offered during the summer at the Duke University Marine Laboratory, Beaufort, North Carolina. The Department of Botany also participates in the semester programs at the Marine Laboratory. See Marine Sciences in this bulletin and consult the *Bulletin of Duke University: Marine Laboratory* for further information.

THE UNIVERSITY PROGRAM IN GENETICS

Courses offered by the Department of Botany are an integral part of this interdepartmental program. Refer to the announcement in this bulletin under Genetics—the University Program, for a listing of other offerings.

THE MAJOR

For the A.B. Degree

This degree program is the general liberal arts major program. Preprofessional students should elect the bachelor of science degree program.

Prerequisite. Introductory college biology or advanced placement in botany.

Corequisites. Two courses in introductory chemistry (Chemistry 11, 12) or advanced placement in chemistry; one course in college mathematics or equivalent.

Major Requirements. A minimum of eight approved botany or closely related science courses, in addition to the prerequisite and corequisites: including 145L (plant diversity) and at least four courses selected from the following: 142L (plant systematics), 146L (plant ecology), 151L (plant physiology), 160L (plant anatomy), and 180 (principles of genetics); and one course in zoology (animal diversity or any course numbered 100 or above). The Director of Undergraduate Studies must approve the selection of any science courses in related departments to be included in the eight courses for the major. Students' programs are tailored to their interests and plans for the future.

For the B.S. Degree

This degree program is recommended for all preprofessional students.

Prerequisite. Introductory college biology or advanced placement in botany.

Corequisites. Chemistry through one semester of organic and one semester of biochemistry, two courses in college mathematics or equivalent, and one year of college physics.

Major Requirements. Eight science courses as described under major requirements for the A.B. degree with the exception of the one course in zoology. A proficiency in reading German, or another approved foreign language in which biological literature is accumulating. The language proficiency may be demonstrated by passing the second year of the language at Duke University, or by earning a B in

the language courses numbered 181, 182, or by passing the FLETS examination. A course in statistics is recommended. The emphasis in this preprofessional program will depend on the student's interests; each program is arranged on an individual basis.

For the Interdepartmental Concentration and Biology Major

An interdepartmental program (e.g., in cell and molecular biology, physical biology, and marine biology) may be pursued instead of a departmental major. The appropriate Director of Undergraduate Studies in botany or zoology can help arrange for such programs. See requirements under Biology for a biology major.

Honors

The department offers a program for graduation with distinction in botany. See the section on honors in this bulletin. The program is usually initiated during the junior year and involves participation in at least two semesters of independent study (Botany 191, 192). The research paper which results from this experience is submitted to a departmental committee for review, followed by a discussion of the paper with the student. On the basis of the quality of the research report and the student's performance in the discussion of it, the committee may recommend the student for graduation with distinction in botany.

Canadian Studies Program

Professor Leach, *Director*

The program in Canadian studies provides the student with an understanding of Canada and its problems and prospects. Students may undertake the program to supplement another major, or to complete a second major in Canadian studies, or as part of an interdepartmental concentration, or under Program II. See sections below on the program and the major. The courses are described in the departmental and interdisciplinary listings.

COURSES WITH FULL CANADIAN CONTENT

The following courses count as one full course in the four required for the program in Canadian studies and in the eight required for the major in Canadian studies:

Economics

52. Competition, Monopoly, and Welfare. *Tower**

English

186. Canadian Literature in English. *Armitage*

French

169. The Contemporary Novel in French Canada. *Tetel*

Interdisciplinary Courses

184. An Introduction to Canada and Canadian Issues. C-L: Economics, History, Political Science, and Sociology 184. *Leach*

282S. Canada. C-L: Anthropology, Economics, History, Political Science, and Sociology 282S. *Leach*

Sociology

298S. Comparative Political Behavior: United States and Canada. *Smith*

COURSES WITH SIGNIFICANT CANADIAN CONTENT

Two of these partial content courses may count as one full course among the four required for the program in Canadian studies and among the eight required

*Full Canadian content is given to Dr. Tower's section only.

for the major in Canadian studies, but no more than two partial content courses may be counted as full content courses in this way. All other partial content courses may count only for a half credit for Canadian studies majors and programs.

Anthropology

- 117. Language, Law, and Politics. By special arrangement this course may be counted as a full content course. *O'Barr*
- 119. Language, Culture, and Society. *Apte*
- 204S. The Anthropology of Cities. *Fox or Smith*
- 281S. Seminar in Selected Topics: Comparative Ethnicity. *Fox*

Economics

- 51. National Income and Public Policy. *Tower*
- 265S. International Trade and Finance. *Tower*

Education

- 100. Social and Philosophical Foundations of Education. *DiBona*

Forestry and Environmental Studies

- 194. Conserving Natural Resources. *Royer*
- 283. Environmental Policy and Values. *Royer*

French

- 114. Language and Civilization of Quebec. *Staff*
- 131S. French in the New World. *Hull*
- 132. Literature and History of Quebec. *Staff*

History

- 121. Diplomatic History of the United States. *Davis*
- 167S. United States and Canadian Constitutional Issues. *Cahow*
- 215. The Diplomatic History of the United States. *Davis*
- 297S. The British Empire of the Nineteenth Century. *Cell*

Law

- 260. Seminar on the Law of the Sea. *Robertson*

Music

- 74. Introduction to Jazz. *Staff*
- 185S. Seminar in the Canadian Art Song. *Hanks*

Political Science

- 175. Political Parties and Legislatures in Western Democracies. *Kornberg*
- 195. Comparative Political Behavior in the United States and Canada. *Kornberg*
- 277. Comparative Party Politics. *Kornberg*
- 293. Federalism. *Leach*

Public Policy Studies

- 264S. Research Seminar: Decision Making. *Payne*

Religion

- 233. Modern Narratives and Religious Meanings. *Kort*

Sociology

- 10D. Introduction to Sociology. *Smith*
- 145. The Modern City in Perspective. *Myers or Smith*
- 170. Mass Communication. *Smith*
- 178. Colonialism, Neocolonialism, and Internal Colonialism. *Tiryakian*
- 196S.2 Sociology of Regional Nationalism in Advanced Societies. *Tiryakian*

THE PROGRAM

In the Canadian Studies Program a student must take four courses with Canadian content or their equivalents. These must include Interdisciplinary Course 184. It is recommended that students who do not have the equivalent of two years of college level French should take French 181 and 182, Intensive French.

THE MAJOR

Corequisite. Completion of another major.

Major Requirements. Eight courses in Canadian studies, including Interdisciplinary Course 184 and seven other semester-course credits in courses on Canada with full or significant content at the 200 level, or approved independent study, or special reading courses. Two of the courses with significant Canadian content may count as half courses to make up the eight required courses. No more than two courses required for the first major may be counted for the Canadian studies major.

To complete the major in Canadian studies a student must also take at least two full years of college level French, or must possess an equivalent competence in the language as certified by the Department of Romance Languages.

Chemistry (CHM)

Professor Lochmüller, *Chairman*; Professor Wilder, *Director of Undergraduate Studies*; Professor Bonk, *Supervisor of Freshman Instruction*; Professors Arnett, Chesnut, Fraser-Reid, Jeffs, Krigbaum, McPhail, Palmer, Poirier, Porter, Quin, Smith, Strobel, and Wells; Associate Professors Baldwin, Crumbliss, Henkens, and Shaw; Assistant Professors Anderson and Sternbach; Adjunct Professor Pitt; Adjunct Associate Professors Ghirardelli and Spielvogel

Courses with laboratories include fifty to sixty hours of laboratory work per term.

11, 12. Principles of Chemistry. The introductory course for students who intend to take any additional chemistry courses other than Chemistry 103. 11: emphasizes stoichiometry and atomic and molecular structures. 12: emphasizes thermodynamics, chemical kinetics, synthesis, and analysis. Laboratory work includes both qualitative and quantitative analysis. Prerequisites: one year of high school chemistry or consent of instructor and qualification for Mathematics 31. Two courses. *Bonk and staff*

41, 42. Chemical Fundamentals. Generally paralleling Chemistry 11, 12, but enriched and discussion-oriented for selected able potential science majors. Laboratory. Prerequisite: consent of instructor; for 42: Chemistry 11 or 41. Two courses. *McPhail and Strobel*

103. Chemistry and Society. Past discoveries and current challenges: a chemical background for decisions involving energy, radiation, pollution, drugs, food additives, vitamins, and pesticides. For students not majoring in a natural science or continuing in chemistry. Not open to students having credit for Chemistry 11 or equivalent. One course. *Wells and staff*

117. Inorganic Chemistry. Bonding, structures, and reactions of inorganic compounds studied through physical chemical concepts. Prerequisite: Chemistry 161. One course. *Crumbliss, Palmer, and Wells*

118. Advanced Laboratory. Advanced laboratory course incorporating techniques from analytical, biological, inorganic, organic, and physical chemistry. Laboratory. Prerequisite: consent of instructor. One course. *Staff*

132. Quantitative and Instrumental Analysis. Practice in advanced quantitative analysis and in the use of chemical instrumentation. Theoretical and applied aspects of chemical and instrumental methods. Laboratory. Prerequisite: Chemistry 161. One course. *Anderson, Lochmüller, and Strobel*

151, 152. Organic Chemistry. The structures and reactions of the compounds of carbon. 151 laboratory: techniques of separation and structure determination.

152 laboratory: organic reactions and preparations. Prerequisite: Chemistry 12 or 42 or consent of Director of Undergraduate Studies; for 152: Chemistry 151 or 151M. Two courses. *Arnett, Baldwin, Fraser-Reid, Jeffs, Porter, Quin, Sternbach, and Wilder*

152P. Preceptorial. Elective for students in Chemistry 152. Laboratory. Prerequisite: consent of instructor. *Staff*

155. Spectral and Structural Study of Organic Compounds. Advanced study of spectral properties and structural aspects of organic compounds and the influence of structure on reactivity. Laboratory work emphasizes the systematic identification of compounds by their spectral aspects and by their chemical properties. Prerequisite: Chemistry 152. One course. *Quin*

161. Physical Chemistry. Fundamentals of theoretical chemistry with particular emphasis on chemical thermodynamics and kinetics. Laboratory. Prerequisites: Chemistry 152 and Physics 52 and Mathematics 32 or 34. One course. *Chesnut, Henkens, Krigbaum, McPhail, Poirier, and Smith*

162. Physical Chemistry. Fundamentals of theoretical chemistry with particular emphasis on quantum chemistry, molecular structure, and molecular spectroscopy. Laboratory. Prerequisites: Chemistry 161 and either Mathematics 103 or 105 or consent of instructor. One course. *Chesnut, Henkens, Krigbaum, McPhail, Poirier, and Smith*

175. Molecular Basis of Biological Processes. A survey of the structures, reactions, and mechanisms of action of important biological molecules. Prerequisite: Chemistry 152. One course. *Shaw*

176. Biophysical Chemistry. The physical chemistry of and experimental methods employed in the study of biological macromolecules. Students may not receive credit for both Chemistry 176 and 196S. Prerequisites: Chemistry 161 and 175. One course. *Henkens*

191, 192. Independent Study. Supervised reading and research. Prerequisite: consent of Director of Undergraduate Studies. Two courses. *Staff*

193, 194. Independent Study. Supervised reading and research. Prerequisites: Chemistry 191, 192, and consent of Director of Undergraduate Studies. Two courses. *Staff*

195S, 198S. Seminar. Topics from various areas of chemistry, changing each year. For example: organic chemistry of biologically important compounds, chemical basis of pharmacology, metal ions in biological systems. Open to senior chemistry majors or by consent of instructor. Two courses. *Staff*

196S. Seminar. Selected topics in physical chemistry of biological macromolecules. Students may not receive credit for both Chemistry 176 and 196S. Prerequisites: Chemistry 161 and 175. One course. *Henkens and Shaw*

197S. Seminar. Special topics in biological chemistry (e.g., immunochemistry, molecular biology). Prerequisite: Chemistry 161; Chemistry 175 recommended. One course. *Staff*

For Seniors and Graduates

201. Molecular Spectroscopy. Selected spectroscopic methods in the study of molecular structure. Symmetry and group theoretical basis for selection rules, theories of magnetic and optical resonance, and interpretation of spectra; examples from both inorganic and organic chemistry. Prerequisite: consent of Director of Undergraduate Studies. One course. *Staff*

203. Quantum Chemistry. Basic principles of quantum and group theoretical methods. Topics include symmetry, a review of the fundamentals, and the

mathematical foundations of quantum theory. Emphasis on the application of molecular orbital theory to organic and inorganic systems. Prerequisite: Chemistry 162. One course. *Chesnut*

205. Structure and Reaction Dynamics. Structure and mechanisms in organic and inorganic compounds, substitution reactions, linear free energy relations, and molecular rearrangements. Emphasis on the use of kinetic techniques to solve problems in reaction mechanisms. Prerequisite: consent of Director of Undergraduate Studies. One course. *Staff*

207. Principles of Kinetics, Thermodynamics, and Diffraction. Prerequisite: consent of Director of Undergraduate Studies. One course. *Staff*

209. Advanced Chemistry. A combination of three one-third course segments from Chemistry 201, 203, 205, and 207. Interested students should consult the Director of Undergraduate Studies for scheduling. Prerequisite: consent of Director of Undergraduate Studies. One course. *Staff*

275, 276. Advanced Studies. (1) Analytical chemistry, (2) inorganic chemistry, (3) organic chemistry, and (4) physical chemistry. Open to especially well-prepared undergraduates by consent of Director of Undergraduate Studies. Two courses. *Staff*

COURSES CURRENTLY UNSCHEDULED

151M. Organic Chemistry

THE MAJOR

Differing major programs are offered under the baccalaureate degrees. The Bachelor of Arts degree programs permit greater flexibility in allowing students to select an area of concentration while satisfying the junior-senior small group learning experience requirements through seminar courses (option one) or through independent study in chemistry or related departments (option two). Of special significance is the area of biological chemistry; under the direction of the biological chemistry program coordinator, students may specialize in this area with either seminars (option three) or independent study in chemistry or related departments (option four) satisfying the junior-senior small group learning experience requirement. The Bachelor of Science degree program provides in-depth preparation for graduate study in chemistry; it is accredited by the American Chemical Society.

For the A.B. Degree

Prerequisites. Chemistry 11, 12; or Chemistry 41, 42; or advanced placement. Mathematics 31, 32 (or 33, 34); Physics 51, 52.

Major Requirements. Chemistry 132, 151, 152, 161, *plus* one of the following options:

1. Two of the following: Chemistry 117, 155, 162, 175, 176, 195S, 196S, 197S, 198S.
2. One of the following: Chemistry 117, 155, 162, 175; *plus* Chemistry 191, 192 or the equivalent in a natural science, in mathematics, engineering, or in a basic science department in the School of Medicine.
3. Chemistry 175, 195S or 197S, and 176 or 196S.
4. Chemistry 175 and 176; and Chemistry 191, 192 in a biochemically related area, or the equivalent in a biological area, biomedical engineering, or basic science department in the School of Medicine.

Recommendations. Computer Science 51 or Engineering 51, Mathematics 103 or 105 (for options one and two); Chemistry 162; two courses in a foreign language or the equivalent. Students planning graduate study are advised to take these

recommended courses and to consult with advisers regarding appropriate additional courses.

For the B.S. Degree

Prerequisites. Chemistry 11, 12; or Chemistry 41, 42; or advanced placement. Mathematics 31, 32 (or 33, 34); 103 (or 105); Physics 51, 52; two courses in German or Russian or the equivalent.

Major Requirements. Chemistry 117, 132, 151, 152, 161, 162, plus four of the following courses: Chemistry 118, 155, 175, 176, 191, 192, 195S, 196S, 197S, 198S, 201, 203, 205, 207, 209, 275, or 276, with at least two being selected from the laboratory courses 118, 155, 191, 192. In an exceptional case and with the prior approval of the Director of Undergraduate Studies, a student may substitute one advanced level nonindependent study course, or a two-course independent study sequence, in an appropriate science department in Trinity College, the School of Engineering, or the School of Medicine for one of the two optional nonlaboratory chemistry courses. A course directly paralleling one offered by the chemistry department may not be substituted. Chemistry 201, 203, 205, and 207 are offered also in one-third semester segments; in some instances a student may wish to take some combination of three of these segments by registering for Chemistry 209. Additional details may be obtained from the Director of Undergraduate Studies.

Recommendations. Computer Science 51 or Engineering 51; Mathematics 104; Physics 100. Students planning graduate study in chemistry should consult with advisers regarding appropriate additional courses.

Honors

The department offers a program for graduation with distinction in chemistry. See the section on honors in this bulletin. The program involves two semesters of independent study, taken either in the chemistry department (Chemistry 191, 192), or as part of the Bachelor of Arts degree in option four with the consent of the biological chemistry program coordinator. A research paper based on the independent study and submitted to a departmental committee for review forms the basis for an oral report by the student. The departmental committee may recommend the student for graduation with distinction in chemistry. Additional details may be obtained from the Director of Undergraduate Studies.

Chinese

For courses in Chinese, see Asian and African Languages.

Classical Studies (cs)

Professor Newton, *Chairman*; Associate Professor Stanley, *Director of Undergraduate Studies*; Professors Oates, Richardson, and Willis; Associate Professors Burian, Rigsby, and Younger; Assistant Professor Boatwright; Visiting Professor Michels

The essential purpose of classical studies is to increase knowledge and understanding of the roots of Western culture in the civilizations of Greece and Rome. Towards this aim, the department offers courses and majors in three areas: Latin, Greek, and classical studies. Concentration in the languages offers students the unique experience of exploring at first hand the literature, history, and thought of antiquity. In the process, students will gain a deeper insight into language itself, as well as an appreciation of the problems of interpretation and the varieties of evidence upon which interpretation may be based. For students interested in history, ancient art, or archaeology, courses in classical studies offer a means of assessing the intentions and achievements of the record, the culture, and the material remains of Greece and Rome in their own rich and varied context.

A secondary aim is, and has been by a centuries-old tradition, the development of a keener perception and understanding of the cultural forces at work in the contemporary world. As a result, the field of classical studies is a valuable and respected foundation for advanced work in other academic disciplines as well as professional programs in law, medicine, and finance.

GREEK (GRK)

1-2. Elementary Greek. A study of grammar and an introduction to reading. Two courses. *Willis*

11-12. Elementary Modern Greek. An introduction to literary and conversational demotic Greek. Two courses. *Younger*

63-64. Intermediate Greek. Introduction to Greek prose and poetry. 63: Plato's *Apology of Socrates* and two dialogues. 64: two plays of Euripides. Two courses. *Rigsby*

103S, 104S. Advanced Greek. 103S: Herodotus and Thucydides. 104S: introduction to the *Odyssey* and Greek lyric poetry. Two courses. *Oates*

203. Homer. Problems of language and structure in the *Iliad*; present state of Homeric scholarship. One course. *Stanley*

205. Greek Lyric Poets. Fragments of the early lyric poets; selected odes of Pindar and Bacchylides. One course. *Burian*

206. Aeschylus. The *Oresteia*, with study of the form of *Agamemnon* and its place in the design of the trilogy. One course. *Willis*

226. Orators. Selections from the principal Attic orators, with emphasis on Lysias and Demosthenes. One course. *Willis*

Courses offered each year on demand in consultation with the Director of Undergraduate Studies:

87, 88. Sight Reading in Greek Prose. Readings from easy Attic prose writers. Prerequisites: one year of college Greek or the equivalent and consent of instructor. Two half courses. *Staff*

117T. Greek Prose Composition. The course content is determined by the needs of the students enrolled. One course. *Willis*

191, 192. Independent Study. Directed reading and research. Open only to qualified juniors and seniors. Two courses. *Staff*

193, 194. Directed Research in Greek. Research culminating in the writing of one longer or two shorter papers as partial fulfillment of the requirements for graduation with distinction. Open only to senior majors. Two courses. *Staff*

Note: Greek 181S, 182S are offered each summer. They provide an intensive introduction to the language and literature. Prerequisite: proficiency in another language. Two courses each. Staff.

Courses Currently Unscheduled

209. Euripides

210. Aristophanes

221. Early Greek Prose

222. Thucydides

231. Hellenistic Poetry

LATIN (LAT)

1-2. Elementary Latin. Study of the structure of the language (forms, vocabulary, syntax, and pronunciation); selected readings in prose and poetry. Two courses. *Stanley*

63, 64. Intermediate Latin. 63: selected prose (Caesar, Pliny). 64: readings from Vergil's *Aeneid*. Two courses. *Boatwright*

103S, 104S. Advanced Latin. 103S: Catullus and Sallust. 104S: Livy and Horace. Two courses. *Staff*

105S. Ovid: The Metamorphoses. The poem studied as representative of Ovid's varied narrative art, as the largest-scale Roman treatment of classical myths, and in the light of the distinctively Ovidian attitude toward Augustanism. One course. *Newton*

106S. Roman Satire. A survey of the genre with concentration on Horace and Juvenal. One course. *Richardson*

115S. Tacitus. Selections from the *Annales*, with concentration on the books devoted to the reign of Nero. One course. *Boatwright*

151S. Cicero. One course. *Richardson*

153S. Petronius. The *Satyricon*, its historical background, and the traditions of the ancient novel. One course. *Staff*

203. Epic: Vergil. The *Aeneid*. One course. *Newton*

210. Lyric and Occasional Poetry. Shorter verse forms: epigram, pastoral, song, and panegyric. One course. *Richardson or Burian*

211. Elegiac Poets. The traditions of Roman love elegy and its development in Propertius, Tibullus, and Ovid. One course. *Richardson*

221. Medieval Latin. Selected works of the Latin Middle Ages from Prudentius to the humanists; genres studied usually include the hymn, sequence, drama, lyric, saints' lives, chronicle, epic, and epistle. C-L: Medieval and Renaissance Studies. One course. *Newton*

Courses offered each year on demand in consultation with the Director of Undergraduate Studies:

87, 88. Sight Reading in Classical, Medieval, and Renaissance Latin. Offered especially for students in fields other than classical studies who wish to maintain and refresh their Latin. (Open to students enrolled in other courses in Latin only on the recommendation of their instructors.) C-L: Medieval and Renaissance Studies. Two half courses. *Staff*

117T. Latin Prose Composition. The course content is determined by the needs of the students enrolled. One course. *Staff*

191, 192. Independent Study. Directed reading and research. Open to qualified juniors and seniors. Two courses. *Staff*

193, 194. Directed Research in Latin. Research culminating in the writing of one longer or two shorter papers as partial fulfillment of the requirements for graduation with distinction. Open only to senior majors. Two courses. *Staff*

Note: The designation of Latin 100 applies to one course credit given for advanced placement which will be awarded for scores of 4 or 5 on one or more of the College Board Advanced Placement tests in Latin. One course credit may be earned by a score of 3 if the student successfully completes one further semester of Latin.

Latin 181S, 182S are offered each summer. They provide an intensive introduction to the language and literature. Prerequisite: proficiency in another language. Two courses each. Staff.

Courses Currently Unscheduled

112S. Comedy

201. The Verse Treatise

204. Epic

CLASSICAL STUDIES (CS)

11. Greek Civilization. The culture of the ancient Greeks from the Bronze Age to Alexander the Great: art, literature, history, philosophy, and religion. Not open to students who have had Classical Studies 53 or History 53. One course. *Rigsby*

11S. Greek Civilization. Same as Classical Studies 11, but in seminar format. One course. *Staff*

12. Roman Civilization. The culture of the ancient Romans from their beginnings to Constantine: art, literature, history, philosophy, and religion. Not open to students who have had Classical Studies 54 or History 54. One course. *Rigsby*

12S. Roman Civilization. Same as Classical Studies 12, but in seminar format. One course. *Staff*

53. Greek History. The political and intellectual history of the Hellenes from earliest times to the death of Alexander the Great. Not open to students who have Classical Studies 11. C-L: History 53. One course. *Boatwright*

54. Roman History. The Roman Republic and Empire to the Council of Nicaea. Not open to students who have had Classical Studies 12. C-L: History 54. One course. *Boatwright*

57S, 58S. Seminar in Classical Studies. Aspects of the history, art, and literature of classical Greece and Rome. For freshmen and sophomores. Two courses. *Staff*

63. The Epic. Reading in translation of major epics from antiquity and the Middle Ages, such as *Gilgamesh*, Homer's *Iliad* and *Odyssey*, Vergil's *Aeneid*, and *Beowulf*. One course. *Burian*

64. The Drama. Reading in translation of Greek and Roman tragedies (Aeschylus, Sophocles, Euripides, Seneca) and comedies (Aristophanes, Menander, Plautus, Terence). C-L: Drama 64. One course. *Burian*

99. Perspectives in Archaeology. See Interdisciplinary Course 99. C-L: Anthropology 99 and Religion 99. One course. *Meyers, Younger, and Zagarell*

115. The Classical Tradition. The notion of the "classical" from the creation of the archetype to the present. One course. *Burian*

117. Ancient Mythographers. Myth in classical and medieval writers from Hesiod to Boccaccio. C-L: Medieval and Renaissance Studies. One course. *Newton*

125. Greek Art and Archaeology. Greek architecture, sculpture, and painting from the Bronze Age to the classical period. Study of objects in the Duke classical collection. One course. *Younger*

126. Roman Art and Archaeology. Roman achievement in architecture, decoration, portraiture, and relief sculpture, from the Villanovans to the Antonine emperors. One course. *Younger*

127. Early Christian Culture: Evidence of Art and Literature. C-L: Art 127 and Religion 127. One course. *Epstein and Gregg*

- 133. Early Greece and the Near East.** Political, social, and intellectual developments from the world of Homer to the Persian Wars. C-L: History 100. One course. *Oates*
- 134. The Athenian Empire.** Imperial democracy at Athens and its consequences for the *polis*. C-L: History 125. One course. *Oates*
- 135. Alexander the Great.** His career and the effects of his conquests. C-L: History 126. One course. *Oates*
- 137. The Roman Revolution.** Rome from the time of the Gracchi to the death of Augustus. C-L: History 103. One course. *Oates*
- 138. The Decline and Fall of the Roman Empire.** From the reign of Nero to the period of Justinian. C-L: History 152. One course. *Oates*
- 146. City and Country in Ancient Italy.** Readings and lectures on urban culture and its relation to the land, from the Greek colonization to the end of antiquity. The Greek cities of the Bay of Naples, Pompeii and Herculaneum, and Rome and its suburbs. Conducted each summer in Italy. Prerequisite: Classical Studies 12 or 54. One course. *Staff*
- 147. Ancient Greece.** On-site study of the cultures in Greece from Neolithic to Medieval, concentrating on Athens, the Peloponnese, Crete, and the Cyclades. Prerequisite: Classical Studies 11 or 53 or 125 or 126 or History 53 or consent of instructor. One course. *Younger*
- 155. The Aegean Bronze Age.** Application of archaeological techniques and procedures to problems in the development of the Minoan and Mycenaean civilizations. One course. *Younger*
- 156. Principles of Archaeology.** Ethics, techniques, and methods of archaeological research, including excavation and surveying of local sites. One course. *Younger*
- 161S. Athens.** The city from antiquity to the present, concentrating on its monuments, self-image, and influence. One course. *Younger*
- 162S. Pompeii.** Contributions of the city to knowledge of ancient Roman life: its history, houses and temples, amusements, economy, and municipal administration. One course. *Richardson*
- 191, 192. Independent Study.** Directed reading and research. Open only to qualified juniors and seniors. Two courses. *Staff*
- 193, 194. Directed Research in Classical Studies.** Research culminating in the writing of one longer or two shorter papers as partial fulfillment of the requirements for graduation with distinction. Open only to senior majors. Two courses. *Staff*
- 195S, 196S. Junior Seminar in Classical Studies.** The subject will vary each year according to the interest of the instructor. Two courses. *Staff*
- 197S. Readings in Classical Philology.** Supplementary material, primary and secondary, not covered in students' previous work. Open only to majors in Latin, Greek, or classical studies. One course. *Staff*
- 231S. Greek Sculpture.** One course. *Younger*
- 232S. Greek Painting.** Prerequisite: consent of instructor. C-L: Art 220S. One course. *Bruzellius or Stanley*
- 233. Greek Architecture.** Development of form and function in the various religious, civic, and domestic building types, from the Bronze Age through the Hellenistic period. One course. *Richardson*

234. Roman Sculpture. The evolution of religious, commemorative, and decorative relief, and portrait and monumental sculpture. From Italic origins to the later Empire. One course. *Younger*

235S. Roman Architecture. An intensive study of selected monuments. One course. *Richardson*

236S. Roman Painting. The techniques, iconography, and use in decoration. One course. *Richardson*

261. The Roman Revolution, 146-30 B.C. One course. *Rigsby*

Courses Currently Unscheduled

144. Ancient Cities: Rome and Its Colonies

255. The Age of Pericles

THE MAJOR

Students may choose first or second majors in Greek, Latin, or in classical studies (ancient history or archaeology).

Students majoring in either Greek or Latin who contemplate graduate work are reminded of the necessity for competence in both languages and a reading knowledge of French and German for all higher degrees.

Prospective second majors in Latin, Greek, or classical studies are urged to consult with the Director of Undergraduate Studies at the earliest feasible time, preferably by the sophomore year.

Majors are eligible for nomination to one semester during their junior year at the Intercollegiate Center for Classical Studies in Rome, of which Duke University is a founding member, at a cost comparable to that of a semester at Duke. Financial arrangements are made through the University, and students may apply for scholarship assistance. Courses in Greek, Latin, ancient history, and archaeology taken at the center are counted toward the major requirements. For further information, see the section on study abroad.

Greek

Prerequisite. Greek 2 or equivalent.

Major Requirements. Six courses in Greek above the level of Greek 12 and Classical Studies 197S. In addition, students will be required to pass an examination testing proficiency in Greek composition or to complete Greek 117. Students entering with three or more years of ancient Greek are urged to consult with the Director of Undergraduate Studies to develop a program suited to their specific needs and interests.

Related Work. Greek majors normally take at least four courses in Latin and are also encouraged to take course work in ancient history and/or archaeology. The nature and amount of related work, however, may vary with the student.

Latin

Prerequisite. Latin 64 or equivalent.

Major Requirements. Six courses in Latin above the level of Latin 64 and Classical Studies 197S. In addition, students will be required to pass an examination testing proficiency in Latin composition or to complete Latin 117.

Related Work. Latin majors normally take at least four courses in Greek and are also encouraged to take course work in ancient history and/or archaeology. The nature and amount of related work, however, may vary with the student.

Classical Studies (Ancient History or Archaeology)

Prerequisites. Classical Studies 11 and 12; or 53 and 54; or 57S and 58S.

Major Requirements. Eight courses at the 100 level or above, including Classical Studies 197S and at least one other seminar or course of independent study. Reading knowledge of Latin or Greek to the level of Latin 64 or Greek 64. Two courses in the ancient languages above that level may be counted toward the major.

Honors

The department offers work leading to graduation with distinction. See the section on honors in this bulletin.

Comparative Area Studies

A. Kenneth Pye, *Director*

The program in comparative area studies offers students comparative, interdisciplinary study of one or more regions of the world. Students may elect to complement this study with a concentration in international relations. Students in the program are currently studying Latin America, Africa, the Middle East, Russia, South Asia, East Asia, and Western Europe. The program draws its offerings from existing courses taught by Duke professors in a dozen cooperating departments. The program and its major (see requirements below) are administered by the Director and an advisory committee of faculty members representing the various areas and cooperating departments. The requirements of the program are being revised. Inquiries should be directed to the Director, Comparative Area Studies, 2122 Campus Drive, Durham, North Carolina 27706.

A special feature of the major is provision for granting credit to students who wish, and who are qualified, to study abroad in the area of choice or to undertake intensive summer language programs in the United States.

The courses listed below may be taken for credit as introductory courses, comparative courses, international relations courses, and area courses. Others may be selected with the approval of the Director. Courses in basic language instruction are not included, but courses in advanced language and literature that can be used to meet the language requirement (not the area requirement) for the major are shown under the appropriate area headings. For a complete description consult the listing under the appropriate department.

INTRODUCTORY COURSES

Anthropology 94. Elements of Cultural Anthropology. *Staff*

History 25. Introduction to World History: to 1700. *Staff*

History 26. Introduction to World History: since 1700. *Staff*

History 109. Contemporary International Problems. *Staff*

History 175, 176. Third World and the West. *Staff*

Political Science 92. Comparative Politics. *Staff*

Religion 57. Introduction to the Religions of Asia. *Bradley, Corless, Lawrence, and Partin*

Sociology 175. Contemporary International Problems. *Staff*

COMPARATIVE COURSES

Anthropology

115. Sex Roles: A Comparative Perspective. *Staff*

116. Language, Ethnicity, and New Nations. *Apte*

119. Language, Culture, and Society. *Apte or Weller*

130. Social and Cultural Change. *O'Barr or Smith*

134. Political Anthropology. *O'Barr or Smith*

136. Cross-Cultural Studies of Child Socialization. *Quinn*

- 155. Anthropological Approaches to Religion. *Gaines or Weller*
- 164. Peasantry and Peasant Movements. *Fox, Smith, or Weller*
- 168. Beginnings of Civilization. *Zagarell*
- 170. Economic Anthropology. *Quinn or Smith*
- 204S. The Anthropology of Cities. *Fox or Smith*
- 239. Culture and Ideology. *Weller*
- 274S. Inequality in Peripheral Capitalist Societies. *Fox or Smith*

Comparative Literature

- 121. Non-Western Literatures: An Introduction. *Cooke, Fowler, Kunst, and Siddiqi*
- 135. Novel of the Self. *Hedges*

Economics

- 219. Economic Problems of Underdeveloped Areas. *Kelley or Naylor*

History

- 110. Agrarian Insurgency and Labor Movements. *Bergquist and Goodwyn*
- 119, 120. History of Socialism and Communism. *Lerner*
- 195S, 10-196S, 10. International Socialism to the First World War. *Miller*
- 239. History of Socialism and Communism. *Lerner*
- 297S. The British Empire of the Nineteenth Century. *Cell*
- 298S. The Commonwealth in the Twentieth Century. *Cell*

Interdisciplinary Courses

- 234S. The Political Economy of Development: Theories of Change in the Third World. *Bergquist, Gereffi, Smith, and Valenzuela*

Music

- 136. Introduction to Non-Western Music. *Seebass*

Political Science

- 107. Comparative Environmental Policies. *McKean*
- 162. Comparative Government and Politics: Communist and Socialist Political Systems. *Johns*
- 163. Women in Developing Societies. *O'Barr*
- 249. Comparative International Development and Technology Flow. *Braibanti*

Religion

- 71A, 72A. Freshman-Sophomore Seminars: African and Asian Traditions. *Staff*
- 71C, 72C. Freshman-Sophomore Seminars: Analytic, Comparative, and Constructive Studies. *Staff*
- 142. Comparative Mythology. *Partin*
- 143. Mysticism. *Bradley*
- 195A, 196A. Junior-Senior Seminars: African and Asian Traditions. *Staff*
- 195C, 196C. Junior-Senior Seminars: Analytic, Comparative, and Constructive Studies. *Staff*

Sociology

- 178. Colonialism, Neocolonialism, and Internal Colonialism. *Tiryakian*
- 179. Development of Third World Societies. *Staff*
- 210. Comparative Race and Ethnic Relations. *Staff*
- 243. Population Dynamics and Social Change. *Myers*

INTERNATIONAL RELATIONS COURSES

Anthropology

- 133. The Effects of Colonialism and Neocolonialism on Native Peoples. *Quinn or Smith*

Economics

- 108. Economics of War. *Weintraub*
- 201S, 1. Current Issues in Economics. *Davies*
- 265S. International Trade and Finance. *Brock, Bronfenbrenner, Kimbrough, or Tower*

History

- 121, 122. Diplomatic History of the United States. *Davis*
- 128. The United States and Latin America. *Bergquist*
- 178. American Diplomacy during World War II and the Early Cold War. *Davis or Kuniholm*
- 215-216. The Diplomatic History of the United States. *Davis*

- 297S. The British Empire of the Nineteenth Century. *Cell*
 298S. The Commonwealth in the Twentieth Century. *Cell*

Interdisciplinary Courses

- 120, 120A. Perspectives on Food and Hunger. *Johns and staff*

Political Science

- 93, 93D. Elements of International Relations. *Kruzel*
 120. International Conflict and Violence. *Eldridge*
 122. Modern International Politics. *Eldridge*
 149. United States and East Asia. *McKean*
 157. Foreign Policy of the United States. *Holsti*
 172. Political Economy of Global Natural Resources. *Johns*
 173S. Political Economy of World Food Problems. *Johns*
 220S. Problems in International Politics. *Holsti or Hough*
 226S. Theories of International Relations. *Grieco*
 227. International Law. *Pye*
 239S. Current Problems of International Law. *Staff*

Public Policy Studies

257. United States Policy in the Middle East. *Kuniholm*

Sociology

178. Colonialism, Neocolonialism, and Internal Colonialism. *Tiryakian*

AREA COURSES: AFRICA

Anthropology

122. Peoples of the World: Africa. *O'Barr*

History

- 195S.23-196S.23. Issues in the History of Tropical Africa. *Staff*
 255S-256S. Problems in African History. *Staff*

Political Science

161. Comparative Government and Politics: Africa. *Johns*
 171S. Race, Class, and Colonialism in Southern Africa. *Johns*
 280S. Comparative Government and Politics: Sub-Saharan Africa. *Johns*

Religion

255. African Religions. *Long*
 265. Religions of the West African Diaspora. *Lincoln*

AREA COURSES: EAST ASIA

Anthropology

121. Peoples of the World: China. *Weller*

Chinese

- 135, 136. Introduction to Modern Chinese Literature. *Kunst*

Economics

- 201S.9. The Japanese Economy. *Staff*
 232S. Economic History of Japan. *Bronfenbrenner*

History

- 101K. Topics in Premodern Chinese History. *Dirlik*
 141. Roots of the Chinese Revolution. *Dirlik*
 142. The Chinese Revolution in the Twentieth Century. *Dirlik*
 143. Traditional and Early Modern Japan. *Huber*
 144. History of Modern Japan. *Huber*
 195S.07-196S.07. Socialism and Revolution in East Asia. *Dirlik*
 195S.17-196S.17. Processes of Development in Traditional and Modern Japan. *Huber*
 287S, 288S. History of Japan. *Huber*

Japanese

- 155, 156. Readings in Modern Japanese. *Fowler*
- 161. Modern Japanese Fiction in Translation. *Fowler*

Political Science

- 111. Contemporary Japanese Politics. *McKean*
- 149. United States and East Asia. *McKean*
- 169. Politics in Revolutionary China. *McKean*
- 211S. Current Problems and Issues in Japanese Politics. *McKean*

Religion

- 141. Religions of China and Japan. *Corless*
- 149. Buddha and Buddhism. *Corless*
- 218. Religion in Japan. *Corless*
- 287. The Scriptures of Asia. *Bradley*
- 288. Buddhist Thought and Practice. *Corless*

AREA COURSES: LATIN AMERICA

Anthropology

- 124. Peoples of the World: American Indian. *Staff*
- 127. Peoples of the World: Mesoamerica. *Smith*
- 128. Peoples of the World: Caribbean. *Domínguez*

Art

- 181. Pre-Columbian Art and Archaeology. *Staff*
- 182. Latin-American Art. *Staff*
- 281S. Problems in Pre-Columbian Art and Archaeology. *Staff*
- 282S. Problems in Latin-American Art. *Staff*

History

- 128. The United States and Latin America. *Bergquist*
- 131. Mexico and the Caribbean from the Wars of Independence to the Present. *TePaske*
- 132. Major South American Nations, 1850 to the Present. *Bergquist*
- 173. History of Spain from Late Medieval Times to the Present. *TePaske*
- 174. History of Colonial Hispanic America from Pre-Columbian Times to the Wars of Independence. *TePaske*
- 195S, 22-196S, 22. Problems in Latin-American History. *Bergquist or TePaske*
- 231S, 232S. Problems in the History of Spain and the Spanish Empire. *TePaske*
- 265S. Problems in Modern Latin-American History. *Bergquist*

Interdisciplinary Courses

- 234S. Political Economy of Development: Theories of Change in the Third World. *Bergquist, Gereffi, Smith, and Valenzuela*

Political Science

- 151. Introduction to Latin-American Politics. *Valenzuela*
- 152. Authoritarianism and Revolution in Latin America. *Staff*
- 253. Comparative Government and the Study of Latin America. *Valenzuela*

Portuguese

- 181. Brazilian Portuguese. *Staff*
- 182. Contemporary Brazilian Theater. *Staff*

Spanish

- 105. Introduction to Spanish-American Literature. *Fein or Pérez*
- 106S. Spanish-American Short Fiction. *Fein*
- 107S. Spanish-American Civilization. *Fein*
- 146. The Spanish-American Novel. *Fein*
- 166. Nineteenth-Century Prose Fiction. *Pérez*
- 210. History of the Spanish Language. *Garcí-Gómez*
- 245, 246. Modern and Contemporary Spanish-American Literature. *Fein and Pérez*

AREA COURSES: MIDDLE EAST

Anthropology

241. The Rise of Civilization in Mesopotamia and Iran. *Zagarell*

Arabic

- 171S. Modern Arabic Literature in Translation. *Cooke*
173S. Women in Arabic Literature. *Cooke*

Distinguished Professor Courses

- 192S. Critical Contemporary Issues in the Developing World: Asia and the Arabian States.
Braibanti

Interdisciplinary Courses

- 162, 163. Introduction to Islamic Civilization. *Richards*

Music

140. Introduction to Islamic Music. *Siddiqi*

Political Science

- 177, 178. Contemporary Social and Political Development in the Islamic World. *Braibanti*
235S. Comparative Development of Islam. *Braibanti*

Public Policy Studies

- 175S. The Palestine Problem and United States Public Policy. *Kuniholm*
257. United States Policy in the Middle East. *Kuniholm*

Religion

51. Introduction to Judaic Civilization. *Bland or E. Meyers*
110. Archaeology and Art of the Biblical World. *C. Meyers or E. Meyers*
132D. Palestine in Late Antiquity. *E. Meyers*
133. The Foundations of Postbiblical Judaism. *E. Meyers*
134. Jewish Mysticism. *Bland*
135. Jewish Religious Thought. *Bland*
136. Contemporary Jewish Thought. *Bland or E. Meyers*
147. Muhammad and the Qur'an. *Partin*
152. Islamic Mysticism. *Lawrence*
243. Archaeology of Palestine in Biblical Times. *C. Meyers*
244. The Archaeology of Palestine in Hellenistic-Roman Times. *E. Meyers*
284. The Religion and History of Islam. *Partin*

AREA COURSES: RUSSIA AND EAST EUROPE

Economics

293. Soviet Economic History. *Trembl*
294S. Soviet Economic System. *Trembl*

History

- 119, 120. History of Socialism and Communism. *Lerner*
161, 162. History of Modern Russia. *Lerner or Miller*
195S.10-196S.10. International Socialism to the First World War. *Miller*
195S.18-196S.18. Problems in the History of Russia before 1917. *Lerner or Miller*
201S. Aspects of Change in Prerevolutionary Russia. *Miller*
202S. Russian Anarchism: Theory and Practice. *Miller*
239. History of Socialism and Communism. *Lerner*
261-262. Problems in Soviet History. *Lerner*

Polish

174. The Poles: Literature and Society, 1940-1980. *Kryniski*

Political Science

165. Government and Politics of the Soviet Union. *Hough*
166. Soviet Foreign Relations. *Hough*

Russian

124. Masters of Russian Short Fiction. *Jezierski*
161, 162. Introduction to the Russian Novel. *Kryniski*

- 175. Leo Tolstoy. *Jezierski*
- 176. Fyodor Dostoevsky. *Jezierski*
- 177. Introduction to the World of Chekhov. *Jezierski or Krynski*
- 180. Twentieth-Century Russian Literature. *Jezierski*
- 183. Slavic Drama and Theater of the Twentieth Century. *Krynski*
- 196. Readings in Modern Russian. *Staff*
- 201, 202. Russian Novel of the Nineteenth Century. *Krynski*
- 225. Tolstoy. *Jezierski*
- 232. Dostoevsky. *Jezierski*

AREA COURSES: SOUTH ASIA

Anthropology

- 120. Peoples of the World: South Asia. *Apte or Fox*

History

- 195S.21-196S.21. Problems in Indian History. *Richards*
- 247. History of Modern India and Pakistan, 1707-1857. *Richards*
- 248. History of Modern India and Pakistan, 1857 to the Present. *Richards*

Interdisciplinary Courses

- 101, 102. Introduction to the Civilizations of Southern Asia. *Lawrence and staff*
- 162, 163. Introduction to Islamic Civilization. *Richards*

Music

- 138. Music of Southeast Asia. *Seebass*

Religion

- 140. Religions of India. *Bradley or Lawrence*
- 149. Buddha and Buddhism. *Corless*
- 217. Islam in India. *Lawrence*
- 287. Scriptures of Asia. *Bradley*
- 288. Buddhist Thought and Practice. *Corless*

THE MAJOR

In consultation with the Director, students must identify their basic area focus. A student wishing to specialize in an area (such as Western Europe) not indicated in the categories of courses will be required to submit a proposed course of study to the advisory committee for approval. Selection of area is normally made by the end of the sophomore year.

Major Requirements. Any two of the introductory level courses. Four semester courses of which two shall be in an appropriate language for the area, and the other two may be a continuation of the language or two of the following: literature of the area in translation or general linguistics. The Director should be consulted for approval of language choice. Four semester courses in the geographical area of special interest. Three courses in one of the following concentrations: (a) a second geographical area; (b) comparative courses; (c) international relations. Examples of comparative courses and international relations courses fulfilling this requirement are listed above. Seminar: in the senior year, a one-semester interdisciplinary seminar, normally Interdisciplinary Course 150S, that brings together a number of major themes for comparative treatment.

Comparative Literature (CL)

Associate Professor Rolleston (Germanic languages), *Chairman of the Committee on Comparative Literature*; Professors Jantz (Germanic languages), Ryals (English), Tetel (Romance languages), and Wardropper (Romance languages); Associate Professors Burian (classical studies), Dearlove (English), DeNeef (English), Orr (Romance languages), Stewart (Romance languages), and Thomas (Romance languages);

Assistant Professors Gaines (English), Pérez (Romance languages), and Torgovnick (English)

The program consists both of courses in literature written in a foreign language and of literature courses that are comparative in nature. Students contemplating a major in comparative literature should have a reading knowledge of a foreign language and a broad acquaintance with British and American authors. Students taking the major are expected to acquire a reading knowledge of a second foreign language and to familiarize themselves with methods of studying literature in a comparative manner. The program, largely interdisciplinary, is directed by a committee, and the selection of courses for the major requires the approval of the committee. Inquiries concerning eligibility and requirements should be directed to Professor Rolleston, 105 Language Building.

100. Introduction to Comparative Literature. Basic structures of literature understood as fiction-making: the journey, the hero, the storyteller, the goal of community. Texts from the *Odyssey* to contemporary works, with an introduction to theoretical issues. One course. *Rolleston*

120. Theater of the Absurd. Development and cultural, social, and political significance for the twentieth century. One course. *Staff*

121. Non-Western Literatures: An Introduction. Twentieth-century texts (in English translation) from Arabic, Chinese, Japanese, Persian, and Urdu literatures, to be studied against the background of individual traditions as well as thematic convergence through Western influence. C-L: Comparative Area Studies. One course. *Cooke, Fowler, Kunst, and Siddiqi*

124. Continental Humanism. Readings from Boccaccio, Petrarch, Rabelais, Montaigne, Rojas, Cervantes, and Erasmus. One course. *Tetel*

131. A New Realism. The literary-philosophical movement (1830-1900) usually designated as realism arising subsequent to the failure of the romantic vision. One course. *Ryals*

139. Perspectives on Contemporary Fiction. Survey of recent fiction in relation to philosophical, linguistic, and cultural trends, and to traditional and experimental structures. Barth, Beckett, Borges, Bulgakov, Grass, Kawabata, García Marquez, Nabokov, Yourcenar. One course. *Dearlove*

145. The Descent of the Epic. Epic impulses and persistent themes in literary history: Homer, Vergil, Dante, Voltaire, Dostoevsky, T. S. Eliot, and Joyce. One course. *Torgovnick*

159. Tragedy and the Tragic. Sources, social role, and philosophical implications of tragedy from ancient Greece to Shakespeare and the Elizabethans, the classical French theater and modern times. One course. *Burian*

160. An Approach to Comedy. Nature, purpose, and effect of comedy in the theater. Readings from the classics (Aristophanes, Plautus, Terence), the Renaissance (Machiavelli, Shakespeare, Molière, Lope de Vega), the Restoration, and the twentieth century. One course. *Wardropper*

169. The "Classical" Era in European Literature. The ancients versus the moderns; the common ideals underlying the founding of modern national literary traditions between the Renaissance and the French Revolution: Jonson, Racine, Molière, Rousseau, Lessing, Schiller, Jane Austen, and others. One course. *Stewart*

170. The Modern: Problems of Definition, History, and Language. Texts from about 1840 to the present studied with a view to defining "the modern"

against the background of the romantic denial of transcendence and the turn to history, society, nature, and the self as sources of meaning. Baudelaire, Nietzsche, Dostoevsky, Proust, Kafka, Virginia Woolf, Borges. Other poetry and short fiction. One course. *Rolleston*

177. Film Theory. Recent critical developments in Marxist aesthetics, structuralism, semiotics of the image, feminist film theory. Both experimental and Hollywood narrative films. C-L: Film. One course. *Gaines*

180. Romanticism. Romanticism in Germany, France, England, and the United States, exploring fiction and philosophy. One course. *Orr, Rolleston, and Ward*

191, 192. Independent Study. Directed reading and research. Open only to qualified students in the junior year by consent of instructor. Two courses. *Staff*

193, 194. Independent Study. Directed readings and research. Open only to qualified students in the senior year by consent of instructor. Two courses. *Staff*

COURSES CURRENTLY UNSCHEDULED

129. Fantasy and Madness

130. Literature and Film

132. Dada and Surrealism

135. The Novel of the Self

150. Introduction to Literary Criticism

185. Psychoanalysis, Literature, and Film

199. Theory and Practice of Translation

220S. Comparative Literature Seminar

280. Literary Criticism

THE MAJOR

Prerequisites. A reading knowledge of at least one foreign language; a basic survey course in English literature.

Major Requirements. (1) Comparative Literature 100; (2) two courses from those listed under Comparative Literature, or courses of literature in translation that cross national lines and invite comparative interpretation, or courses of literature written in languages that are seldom taught; (3) three courses in a single foreign literature at the 100 level or above, to be read in the original language; (4) acquisition of a second foreign language through at least the intermediate level.

This last requirement may be fulfilled by examination or by completion of such courses as the following: Greek 63-64 or 181S, 182S; Latin 181S, 182S; German 63, 101, or 181, 182; French 63, 74, or 181, 182; Italian 63, 74, or 181, 182; Russian 63, 64; Hindi-Urdu 63, 64; Japanese 63, 64.

The Committee on Comparative Literature helps students in creating a program having unity and direction. It advises students of pertinent conference courses and seminars offered each year in the various literature departments.

Computer Science (CPS)

Professor Gallie, *Acting Chairman*; Associate Professor Ramm, *Director of Undergraduate Studies*; Professors Loveland, Marinos, Patrick, Rosenberg, Starmer, and Woodbury;

Associate Professors Biermann, Kootsey, Trivedi, and Wagner; Assistant Professors Ballard, Bowyer, Geist, Herman-Giddens, and Smith; Adjunct Associate Professor Weste; Adjunct Assistant Professor Pitt; Visiting Assistant Professor Eshraghian; Lecturer Loendorf

The Department of Computer Science provides courses on the concepts of computing and computers, their capabilities, and uses. In most courses students make extensive use of one or more of the available computers as a problem-solving instrument. Students who wish to take a single introductory course, as part of their general education, usually elect Computer Science 51.

51. Introduction to Computing. A course in computing assuming no previous experience. Problem solving using a digital computer. Use of a high level algorithmic programming language. The student will be expected to write a substantial number of programs. Includes use of computer in laboratory-style classes utilizing personal computers. One course. *Staff*

51X. Introduction to Computing. Essentially like Computer Science 51 but covering a broader range of topics in greater depth. For students with previous programming experience. One course. *Staff*

124. Analysis of Algorithms. Design and analysis of efficient algorithms. Design techniques include recursion, divide-and-conquer, and dynamic programming. Applications include sorting, searching, dynamic structures, pathfinding, fast multiplication, fast Fourier transform. Nondeterministic algorithms. Computationally hard problems. NP-completeness. Prerequisites: Computer Science 152 and four semesters of college mathematics. One course. *Lowland*

152. Data Structures. Linear lists such as stacks, queues, dequeues, circular lists, and doubly linked lists; trees; multilinked structures and their use in algorithms. Prerequisite: Computer Science 51 or equivalent. One course. *Staff*

154. Computers and Programming. Computer structure, machine language, instruction execution, addressing techniques, and digital representation of data. Computer systems organization, logic design, microprogramming, and interpreters. Symbolic coding and assembly systems; macrodefinition. Prerequisite: Computer Science 152 or consent of instructor. One course. *Ramm and staff*

155. Program Design and Construction. Substantial programs. Design specifications, choice of data structures, estimation of programming effort, stepwise development, and program-testing methodology. Programming teams and human factors in system implementation. Advanced topics in use of a procedural language and file management. Prerequisite: Computer Science 154. One course. *Herman-Giddens*

157. Introduction to Switching Theory. C-L: Electrical Engineering 157. One course. *Marinos*

191, 192. Independent Study. Directed reading and research for qualified juniors. Prerequisites: consent of instructor and Director of Undergraduate Studies. Two courses. *Staff*

193, 194. Independent Study. Directed reading and research for qualified seniors. Prerequisites: consent of instructor and Director of Undergraduate Studies. Two courses. *Staff*

For Seniors and Graduates

200. Programming Methodology. Practical and theoretical topics including structured programming, specification and documentation of programs, debugging and testing strategies, choice and effective use of programming languages and

systems, psychology of computer programming, proof of correctness of programs, analysis of algorithms, and properties of program schemata. Prerequisite: Computer Science 152. One course. *Wagner*

201. Programming Languages. Information binding, data structures and storage, control structures, recursion, execution environments, input/output; syntax and semantics of languages; study of PL/I, Fortran, Algol, APL, LISP, SNOBOL, and SIMULA; exercises in programming. Prerequisite: Computer Science 200. One course. *Ballard*

204. Computer Network Architecture. The architecture of computer communication networks and the hardware and software required to implement the protocols that define the architecture. Basic communication theory, transmission technology, private and common carrier facilities. Addressing structures and error recovery. Multivendor software compatibility. Economic trade-offs. International standards. Prerequisites: Computer Science 154 and Electrical Engineering 157. C-L: Electrical Engineering 204. One course. *Pitt*

207. Fault-Tolerant Computer Systems. C-L: Electrical Engineering 207. One course. *Marinos*

208. Digital Computer Design. Prerequisite: Computer Science 157 or consent of instructor. C-L: Electrical Engineering 208. One course. *Marinos*

209. Microprocessor Fundamentals and Applications. Prerequisite: Computer Science 157 or consent of instructor. C-L: Electrical Engineering 209. One course. *Marinos*

210. VLSI Systems: an Introduction. A first course in VLSI using the Mead-Conway approach. Topics include (1) the basic components of MOS technology: the transistor and gates constructed therefrom; (2) techniques for composing components into useful logic blocks: array logic, passive logic networks, sequential machines; (3) introduction to techniques for composing logic blocks into systems; and (4) introduction to software systems that aid the design process. Students will complete the design of a small system in NMOS. Prerequisite: Computer Science 157 or equivalent. Taught at the University of North Carolina-Chapel Hill as Comp 268. One course. *Staff*

215. Artificial Intelligence. Heuristic versus algorithmic methods; programming of games such as chess; theorem proving and its relation to correctness of programs; readings in simulation of cognitive processes, problem solving, semantic memory, analogy, adaptive learning. Prerequisite: Computer Science 152 or consent of instructor. One course. *Biermann or Ballard*

220. VLSI Algorithmics. Algorithmic and systems aspects of VLSI. Topics may include theoretical studies of the layout problem, array logic, placement and routing, fault-tolerance in VLSI designs, design for testability, the design of networks of processors, and cost trade-offs in VLSI designs. Prerequisites: Computer Science 210 and 224. One course. *Rosenberg*

221. Numerical Analysis I. Error analysis, interpolation and spline approximation, numerical differentiation and integration, solutions of linear systems, nonlinear equations, and ordinary differential equations. Prerequisites: knowledge of an algorithmic programming language and intermediate calculus. C-L: Mathematics 221. One course. *Gallie or Patrick*

222. Numerical Analysis II. Calculation of eigenvalues and eigenvectors; numerical methods for solving partial differential equations and integral equations. Prerequisite: Computer Science 221 or equivalent. C-L: Mathematics 222. One course. *Patrick or Utiku*

224. Analysis of Algorithms. Design and analysis of efficient algorithms. Design techniques include recursion, divide-and-conquer, and dynamic programming. Applications include sorting, searching, dynamic structures, pathfinding, fast multiplication, fast Fourier transform. Nondeterministic algorithms. Computationally hard problems. NP-completeness. This course is the same as Computer Science 124 with more advanced-level work required of the student. Prerequisites: Computer Science 152 and four semesters of college mathematics. One course. *Loveland or Rosenberg*

225. Formal Languages and Theory of Computation. An introduction to the study of abstract machines and the languages they define, their capabilities, and limitations. Finite-state automata, regular languages, pushdown automata, context-free languages, Turing machines, recursive functions and recursively enumerable sets, noncomputable sets, measures of complexity for algorithms. Prerequisites: four courses in college mathematics. One course. *Loveland or Rosenberg*

226. Mathematical Methods for Systems Analysis I. Basic concepts and techniques used in the stochastic modeling of systems. Elements of probability, statistics, queuing theory, and simulation. Prerequisites: four courses in college mathematics. One course. *Trivedi or Geist*

227. Mathematical Methods for Systems Analysis II. Basic concepts and techniques used in the deterministic modeling of systems. Elements of linear algebra; linear, integer, dynamic, and geometric programming; and unconstrained and constrained optimization. Prerequisites: four courses in college mathematics. One course. *Geist*

231. Introduction to Operating Systems. Basic concepts and principles of multiprogrammed operating systems. Memory, CPU, I/O device management and scheduling. Buffering techniques. Performance evaluation. Case studies of existing systems. Prerequisite: Computer Science 154. One course. *Geist, Smith, or Trivedi*

232. Compiler Construction. Models and techniques used in the design and implementation of assemblers, interpreters, and compilers. Lexical analysis, compilation of arithmetic expressions and simple statements, specifications of syntax, algorithms for syntactic analysis, code generation and optimization techniques. One course. *Wagner*

241. Data Base Methodology. Basic concepts and principles. Relational, hierarchical, and network approaches to data organization; data entry and query language support for data base systems; theories of data organization; security and privacy issues. Prerequisites: Computer Science 154 and either 155 or 163. One course. *Starmer or Herman-Giddens*

252. Computer Systems Organization. Hardware and software aspects. Processor, memory, device, and communication subsystems; case studies of hardware system organization, e.g., parallel, associative, fault-tolerant; organization of software systems to exploit hardware systems organization; economic and reliability aspects of various hardware organizations. Prerequisites: Computer Science 154 and 157. C-L: Electrical Engineering 252. One course. *Trivedi or Loendorf*

265. Advanced Topics in Computer Science. One course. *Staff*

COURSES CURRENTLY UNSCHEDULED

42. Introduction to Digital Systems

100S. Applications of Computers

163. File Management and Data Analysis

THE MAJOR

For the B.S. Degree

Prerequisites. Computer Science 51; Mathematics 33 (or 31), 34 (or 32), 105 (or 103), 106 (or 104).

Major Requirements. Computer Science 152; 154; three of the following: 124, 155, 157, 163, 215, 221, 231, 232, 241; and Mathematics 117 or 135. If Mathematics 135 is elected, it is strongly recommended that it be followed by Mathematics 136. Students must take enough additional courses so that they have completed at least five courses (excluding Mathematics 103, 104, 105, 106) at the 100 level or above in one department other than computer science or in an approved area. A list of areas which have been approved by the department, such as the zoology-chemistry combination often chosen by premedical students, may be obtained from the Director of Undergraduate Studies.

Students planning to do graduate work should try to include Computer Science 221 and modern algebra in their course of study. Students interested in microelectronics design should take courses in physics and chemistry.

Honors. Students who are qualified (see the section on honors in this bulletin) may undertake work leading to a degree with distinction in computer science by applying to the Director of Undergraduate Studies. Normally, candidates must have grades of *A* in computer science courses. They must complete a substantial project, suitably documented, or a distinguished paper on which they will be examined orally by a committee of three faculty members.

Dance

For courses in Dance, see Institute of the Arts.

Distinguished Professor Courses (DPC)

Distinguished Professor Courses enable students, regardless of their majors, to study with some of the most outstanding teachers and scholars within the University. The courses ordinarily focus on topics of broad intellectual and academic interest beyond the scope of a single discipline. They may count toward the distributional requirements, and the division of each is indicated at the end of the description or by the division of a cross-listed course.

190S. Political Experience in the Lives of Leaders. For freshmen only. (Social sciences.) One course. *Barber*

196S. Current Political Problems in Western European and Commonwealth Countries. Prerequisite: consent of instructor. (Social sciences.) One course. *Cole*

199S. Great Books in Biology: Evolution, Genetics, Neurobiology. Analysis of original texts by great pioneers in biology—Darwin, Mendel, Galton, Claude Bernard, Sherrington, and others. Prerequisite: junior standing. C-L: Psychology 199S. One course. *Diamond*

201. Dante's *Inferno*. Reading of the *Inferno*; its use by such authors as Eliot, Joyce, and Beckett. Taught in English. (Humanities.) One course. *Fowlie*

203. Proust. Reading of the seven parts of *A Remembrance of Things Past*, with emphasis on the psychology and the aesthetics of the novel. Taught in English. (Humanities.) One course. *Fowlie*

205S. Soviet Foreign Policy. Prerequisite: junior or senior standing. Not open to students who have completed Political Science 166. (Credit is applicable toward political science major.) (Social sciences.) One course. *Kulski*

COURSES CURRENTLY UNSCHEDULED

192S. **Critical Contemporary Issues in the Developing World: Asia and the Arabian States**

198S. **Possible Effects of Recent Changes in Global Environments**

Drama

For courses in Drama, see Institute of the Arts.

Economics (ECO)

Professor Wallace, *Chairman*; Professor Vernon, *Director of Undergraduate Studies*; Professors Bronfenbrenner, Davies, Goodwin, Grabowski, Graham, Havrilesky, Kelley, Kreps, Lewis, Naylor, Tower, Treml, Weintraub, and Yohe; Associate Professors Clotfelter, Cook, and McElroy; Assistant Professors Brock, C. Conrad, R. Conrad, Kimbrough, Luger, Nickerson, Stahl, Tauchen, and Zarkin

Economics courses aim to develop the critical and analytical skills essential for understanding economic problems and institutions, in both their contemporary and historical settings. Although no particular vocational or professional goal is emphasized, these courses provide the academic background necessary for positions in industry, for work in many branches of government service, for law school, and for graduate study in business administration, economics, and the social sciences.

Students planning to do graduate work in economics are advised to take as many of the following courses in mathematics (listed in preferential order) as their schedules permit: Mathematics 31, 32, 103, 104, 131, 135, and 136.

1. National Income and Public Policy. Basic economic analysis emphasizing current public policy issues. Means of determining the level and rate of growth of aggregate national income and output. Causes of unemployment, inflation, and international payment problems. The effects of monetary policy (money supply and interest rates) and fiscal policy (government expenditures and taxes) on these problems. (Open only to freshmen.) One course. *Staff*

2. Competition, Monopoly, and Welfare. The composition of output and the distribution of income in a market economy. Role of government. Contemporary problems of the environment. Topics such as environmental economics, monopoly, unionism, international trade. Comparison of a market economy with other systems of economic organization. Economic problems of developing countries. (Open only to freshmen.) One course. *Staff*

1D, 2D. The same courses as Economics 1, 2 except taught as lectures with discussion sections. Two courses. *Staff*

51. National Income and Public Policy. See Economics 1. (Open to all students.) One course. *Staff*

52. Competition, Monopoly, and Welfare. See Economics 2. (Open to all students, except those who have had Management Sciences 50.) One course. *Staff*

51D, 52D. The same courses as Economics 51, 52 except taught as lectures with discussion sections. Two courses. *Staff*

53. Economics of Contemporary Issues. Modern economic problems, such as environmental deterioration and urban decay. The market as one of the interrelated subsystems of the social system, from institutionalist, Marxist, and other perspectives in the social sciences. One course. *Havrilesky*

- 60. The Economics of Fisheries.** Taught at Beaufort. One course. *Winter*
- 108. Economics of War.** Conflict theory, causes and economic consequences of war, military personnel, military-industrial complex, disarmament, and the economy. Prerequisite: Economics 52. C-L: Comparative Area Studies. One course. *Weintraub*
- 132. Introduction to Economic History.** A survey of Western economic history: population, production, exchange, and institutions, from antiquity to the present. Prerequisite: Economics 52 or consent of instructor. One course. *Staff*
- 138. Economic Statistics.** Survey of principal concepts and methods of application to economics. (Not open to students who have had Mathematics 53 or 117 or Management Sciences 110 or Psychology 117.) One course. *McElroy, Tauchen, Vernon, or Wallace*
- 139. Introduction to Econometrics.** Data collection, estimation, and hypothesis testing. Use of econometric models for analysis and policy. Prerequisites: Economics 2 or 52 and Mathematics 32 or equivalent and Economics 138 or equivalent. One course. *McElroy, Tauchen, or Wallace*
- 149. Microeconomic Theory.** Cost and supply considerations in price theory; the demand for factors of production. The allocation of resources in the context of competitive and monopolistic market structures. Prerequisites: Economics 2 or 52 and Mathematics 31. (Not open to students who have had Public Policy Studies 110.) C-L: Canadian Studies. One course. *Graham, McElroy, Trembl, Vernon, Wallace, or Zarkin*
- 150. History of Economic Thought.** Approaches to economic problems from Aristotle to Keynes, emphasizing certain models and doctrines—their origins, relevance, and evolution. Readings from Mun, Quesnay, Adam Smith, Malthus, Ricardo, and Marx. One course. *Goodwin*
- 153. Monetary Economics.** The evolution and operations of commercial and central banking and nonbanking financial institutions in the United States, the determination of monetary aggregates and interest rates, the financial impacts of Treasury operations, and the linkages from Federal Reserve actions to price level, employment, economic growth, and balance of payments objectives. Prerequisite: Economics 154. One course. *Brock, Havrilesky, or Yohe*
- 154. Aggregate Economics.** Concepts and measurement of national income and expenditures, employment, interest rates, and price levels; the theoretical determination of these aggregates; applications of macroeconomic theory to business cycles and economic growth. Prerequisites: Economics 1 or 51 and Economics 2 or 52 and Mathematics 31. One course. *Bronfenbrenner, Havrilesky, Stahl, Tauchen, Tower, or Yohe*
- 155. Labor Economics: Analysis and Measurement.** Labor market equilibria. The demand for labor. The supply of labor: human fertility, human capital, hours of work, and labor force participation. Wage levels and differences. Union and government as labor market factors. Prerequisites: Economics 138 and 149 and Mathematics 31. One course. *Lewis or Zarkin*
- 160. Resource Economics and Public Policy.** Microeconomic analysis of nonrenewable resources. Resource scarcity and economic interpretations of doomsday models. Rationale for government intervention into natural resource markets and the effects of governmental policies on investments, rates of extraction, and conservation. Prerequisite: Economics 149. One course. *R. Conrad*
- 184. An Introduction to Canada and Canadian Issues.** Does not count for economics major requirements. C-L: Interdisciplinary Course 184. One course. *Leach*

189. Business and Government. Public policies which most directly affect the operation of competition in the business world. The economic basis for an evaluation of antitrust policy, public utility regulation, and public enterprise. Prerequisite: Economics 149 or consent of instructor. One course. *Grabowski, Vernon, or C. Conrad*

191, 192. Independent Study. Directed reading and research. Prerequisites: consent of instructor and Director of Undergraduate Studies. Two courses. *Staff*

193, 194. Independent Study. Same as Economics 191, 192, but for seniors. Two courses. *Staff*

Junior-Senior Seminars

198S. Economics of Regulation. Analysis of market failure and attempted government solutions. Case studies in regulation: public utilities, health and product safety, and the environment. Prerequisite: Economics 149. One course. *Grabowski or Vernon*

201S.1-202S.1. Current Issues in Economics. Economic analysis of such issues as the health care system, crime and punishment, pollution and the environment, the performing arts, welfare, and the energy crisis. Prerequisites: Economics 138 and 149. C-L: Comparative Area Studies. Two courses. *Davies*

201S.2. Mathematical Economics. Selected mathematical tools from symbolic logic, naive set theory, linear algebra, calculus, analysis, and elementary topology applied to the analysis of economic problems. Topics include consumer choice, production, general equilibrium, and growth. Prerequisites: two courses in college calculus and Economics 149. One course. *Graham*

201S.4. Conflict and Cooperation in Economics. Elements of game theory. Both cooperative and noncooperative games with particular reference to economic problems such as trading, general equilibrium theory, oligopoly, and monopoly. Prerequisite: Economics 149. One course. *Weintraub*

201S.8. Economics of Population. Relationship of population growth to economic development and to natural resource and environmental pressures. Causes and impacts of population change, including economic models of fertility, mortality, marriage, and migration. Prerequisites: Economics 149 and 154. One course. *Kelley*

201S.11. Law and Economics. The impact of law upon economic activity; e.g., the role of contract law in facilitating exchange or the role of product liability in determining the quality of goods produced. Prerequisites: Economics 138 and 149. One course. *Graham*

201S.12. Current Problems in Aggregate Supply. Selected topics in supply-side economics: the natural rate of unemployment, job search, implicit contracts, production and inventory cycles, the impact of tax policy on aggregate production, and the rate of inflation. Prerequisites: Economics 154 or 153 and Economics 138. One course. *Nickerson or Tauchen*

For Seniors and Graduates

200. Capitalism and Socialism. Selected ideological classics of new and old, right and left economics, including both "counsels for perfection" (utopias) and "precepts for action" in political economy. Prerequisites: Economics 149 and 154 or consent of instructor. One course. *Bronfenbrenner*

204S. Advanced Monetary Economics. Monetary theory and its statistical and institutional implementation. Particular attention to the development of

aggregative theories of prices, interest rates, and production; the functioning of monetary policy within various theoretical frameworks; appraisal of recent use and limitations of Federal Reserve policy. Prerequisite: Economics 153. One course. *Havrilesky or Yohe*

205S. Advanced Monetary Theory and Policy. Emphasis on recent issues: innovations in the payments mechanism and new monetary aggregates, the subterranean economy, financial crises, alternative views of the monetary policy transmission mechanism, and the monetarist-fiscalist controversy. Prerequisite: Economics 153. One course. *Havrilesky or Yohe*

212S. Economic Science and Economic Policy. A historical examination of the impact of economics on public policy; special attention to agriculture, labor relations, the Council of Economic Advisers, and the experience of other countries. One course. *Goodwin*

219. Economic Problems of Underdeveloped Areas. Analysis of underdeveloped countries with some attention to national and international programs designed to accelerate development. Prerequisite: Economics 149 or 154 or consent of instructor. C-L: Comparative Area Studies. One course. *Kelley or Naylor*

232S. Economic History of Japan. Japanese economic development, stressing the period since the end of isolation. Prerequisite: one course in economic analysis or Far Eastern history. C-L: Comparative Area Studies and History 260S. One course. *Bronfenbrenner*

233. State and Urban Finance. Expenditures, taxation, and financial administration in state and local governments, with emphasis on current problems. Special attention to research methods and materials, and to the financial relations between state and local governments. Prerequisite: Economics 149 or consent of instructor. One course. *Davies or Luger*

234. Urban and Regional Economics. Presents models: to analyze metropolitan systems and the location of economic activity; to understand the causes of selected urban and regional problems, including unbalanced growth and development, poor housing conditions, residential segregation, deteriorating services, and fiscal crises; and to assess the impact of public policies toward states and substate areas. Prerequisite: Economics 149 or consent of instructor. One course. *Clotfelter or Luger*

235. The Economics of Crime, Law Enforcement, and Justice. An analysis of the social costs of law enforcement and crime, a theoretical and empirical study of criminal deterrence, the measurement and production of law enforcement outputs, and an economic analysis of the courts and correctional system. Prerequisite: Economics 149 or equivalent. One course. *Cook*

237. Statistical Methods. Methods of dealing with problems in business and social science. Simple, multiple, partial, and curvilinear correlation; curve fitting; probability; sampling distributions; and statistical inference. Prerequisite: Economics 138 or consent of instructor. One course. *Staff*

243. Econometrics I. Economic theory, mathematics, statistical inference, and electronic computers applied to analysis of economic phenomena. Objective is to give empirical content to economic theory. Matrix algebra used to develop topics in inference, linear regression, and systems of simultaneous equations. Use is made of the electronic computer. Prerequisites: Economics 149 and 237 or equivalents. One course. *Wallace*

244. Corporate Economics I. Strategic planning models of the firm including marginal analysis, mathematical programming, portfolio, and corporate simulation

models. Economics as the language of corporate planning and modeling. Prerequisites: Economics 138 and 149 or equivalents. One course. *Naylor*

245. Econometrics II. Advanced theory and applications: includes specification error, generalized least squares, lag structures, Bayesian decision making, simultaneous equation methods, and forecasting. Emphasis on current applied literature. Prerequisite: Economics 243. One course. *McElroy or Wallace*

246. Selected Topics in Econometric Theory. Analysis of panel data, combining data from different sources, vector autoregressive methods, problems of causation in time series data, nonlinear estimation, limited dependent variables, sample selection bias, and other topics to be chosen subject to the interests of the class. One course. *Tauchen or Wallace*

250. Modern Economic Thought. Integrated survey of the several major streams of economic theory since 1936. Selected topics from the economics of Keynes, its offshoots and coordinate development, and post-Marxian economic theory. Historical evolution of recent ideas and their interrelations. Prerequisite: Economics 154. One course. *Staff*

265S. International Trade and Finance. Fundamental principles of international economic relations. The economic basis for international specialization and trade and the economic gains from trade, the balance of international payments, problems of international finance, investments, and monetary problems. Prerequisites: Economics 149 and 154. C-L: Canadian Studies and Comparative Area Studies. One course. *Brock, Bronfenbrenner, Kimbrough, or Tower*

285. Evaluation of Public Expenditures. Introduction to cost-benefit analysis applied to public sector spending. Optimal investment decisions; shadow pricing of capital labor, and foreign exchange; risk and uncertainty; and the impact of government expenditures on the distribution of income. Prerequisite: Economics 149. One course. *R. Conrad and Kimbrough*

287. Public Finance. Economic aspects of such problems as the growth of government, the proper role of the state, the centralization and decentralization of government, government bureaucracy, the impact of taxes and spending on the wealthy and the poor, as well as other public policies and questions. Prerequisite: Economics 149. C-L: Canadian Studies. One course. *Davies*

293. Soviet Economic History. Establishment of foundations of a socialist economy: collectivization, industrialization, and search for economic efficiency. C-L: Comparative Area Studies. One course. *Trembl*

294S. Soviet Economic System. Economic planning and administration in the Soviet Union and other socialist countries. International comparisons. Theoretical and applied problems of resource allocation, economic development, and optimal micro decision making in a nonmarket economy. C-L: Comparative Area Studies. One course. *Trembl*

COURSES CURRENTLY UNSCHEDULED

201S.6. Current Problems in International Monetary Arrangements

201S.7. Economics of Discrimination

201S.9. The Japanese Economy

231S. Analytical Economic History

247. Corporate Economics II

282S. Canada

THE MAJOR

Prerequisites. Mathematics 31, Economics 1 or 51, and Economics 2 or 52.

Major Requirements. Economics 149, 154, and any three additional 100- or 200-level courses. Substitution of similar courses in other departments for courses in the economics department will not be permitted. Prerequisites for admission to a junior-senior seminar are two of the following courses: Economics 138, 149, and 154.

Honors. For graduation with distinction at least one junior-senior seminar and an honors paper are required. See the section on honors in this bulletin.

Education (EDU)

Associate Professor Davis, *Chairman and Director of Undergraduate Studies*; Professors Gehman and Page; Associate Professors Ballantyne, Carbone, Di Bona, Johnson, Martin, and Sawyer; Assistant Professors Mayesky and Michlin; Adjunct Professors Eilber and Pittillo; Lecturers Fowler and Leach

Students who desire an understanding of the study of education as part of their liberal arts program should elect courses in accordance with their special interests. Selected courses in education may satisfy distribution requirements in the division of the social sciences. Students who expect to teach should confer with the Director of Undergraduate Studies or other advisers in the program prior to registration each semester. Students interested in certification to teach in elementary schools should consult with Professor Mayesky; those interested in certification to teach in secondary schools should consult with Professors Carbone, Davis, or Martin.

100. Social and Philosophical Foundations of Education. Basic features and assumptions, viewpoints, and issues of education in contemporary America. One course. *Carbone, Di Bona, or Martin*

101, 102. Introduction to the Civilizations of Southern Asia. C-L: Interdisciplinary Course 101, 102. Two courses. *Lawrence and staff*

105. Elementary Education: Reading. Must be accompanied by Education 106. Half course. *Staff*

106. Elementary Education: Language Arts. Must be accompanied by Education 105. Half course. *Staff*

107. Elementary Education: Mathematics. Half course. *Staff*

108. Elementary Education: Science. Half course. *Staff*

114S. Education and Law. Basic steps of legal research and case analysis in the critical examination of judicial, legislative, and executive responses to educational issues and problems. One course. *Martin*

117. Psychology of Personal and Social Adjustment. Principles of mental health affecting individual and social adjustments. One course. *Gehman*

118. Educational Psychology. Emotional and cognitive learning in children, youth, and adults. One course. *Ballantyne or Davis*

121. Infancy, Early Childhood, and Educational Programs. Developmental theories and their practical application in education. Emphasis on parenting and teaching. One course. *Staff*

140. The Psychology of Work. Factors affecting career choice and change. One course. *Ballantyne*

149S. Exceptional Children. Etiology and assessment of major types of exceptionalities, including intellectual abilities, physical or emotional handicaps,

and sensorially impaired. Family relationships and treatment programs. One course. *Davis*

151. Public School Music Education I. C-L: Music Education 151. Half course. *Thompson*

152. Public School Music Education II. C-L: Music Education 152. Half course. *Thompson*

161. Integrated Art in the Public School. Materials and methods in basic two-dimensional art media. Half course. *Stars*

162. Plastic Art in the Public School. Basic three-dimensional art; emphasis on ceramics. Half course. *Stars*

168S. Contemporary Education Criticism. One course. *Carbone, Di Bona, or Martin*

173, 174. Clinical Reading Practicum. Experiences in the diagnosis and correction of reading disabilities in elementary and secondary school students. Prerequisite: consent of instructor. Two courses. *Staff*

191, 192. Independent Study. Directed reading and research for juniors. Prerequisites: consent of instructor and Director of Undergraduate Studies. Two courses. *Staff*

193, 194. Independent Study. Directed reading and research for seniors. Prerequisites: consent of instructor and Director of Undergraduate Studies. Two courses. *Staff*

195S. Elementary Education: Principles. The nature, subject matter, and organization of elementary education for instruction in the primary and intermediate grades. Must be accompanied by Education 196. Half course. *Mayesky*

196. Elementary Education: Internship. Full time for second half of semester. One and one-half courses. *Mayesky*

For Seniors and Graduates

205. Selected Topics. One course. *Staff*

211. Education and the Mass Media. Impact of mass media on behavior, particularly of children. One course. *Di Bona*

213. Elementary School Organization and Administration. Nursery school, kindergarten, and the elementary school. Problems of internal organization and management of elementary school and its integration with secondary school. One course. *Staff*

215S. Secondary Education: Principles. Principles, curriculum, and methods in secondary education. Prerequisite: C average overall and in teaching field or fields. Must be accompanied by Education 216. One course. *Carbone, Michlin, or staff*

216. Secondary Education: Internship. Supervised internship in junior and senior high schools. Full time for half a semester. Two courses. *Carbone, Michlin, or staff*

225. Teaching of History and the Social Studies. Evaluation of the objectives, content, materials, and methods in the teaching of history and the social studies. One course. *Carbone or staff*

227. Contemporary Theories of Counseling and Psychotherapy. Prerequisites: two courses in psychology or educational psychology. One course. *Gehman*

232. Psycho-educational Counseling with Families. Individual and group counseling concerning psycho-educational problems of families. Prerequisite: consent of instructor. One course. *Ballantyne or Davis*

236. Teaching Developmental and Remedial Reading in the Secondary School. Principles, methods, and materials for the development of effective reading attitudes and skills in developmental and remedial programs. One course. *Michlin*

237. Teaching of Literature in Secondary Schools. Conventional, adult, and transitional literature. One course. *Michlin*

239. Teaching of Grammar, Composition, Mechanics, and Usage in Secondary School. Recent developments. One course. *Michlin*

242. Group Counseling. Theories and techniques of counseling for small groups of children, adolescents, teachers, parents, and other adults. Prerequisite: consent of instructor. One course. *Ballantyne or Gehman*

246. Teaching of Mathematics. Aims, curriculum, and classroom procedure for teaching secondary school mathematics. One course. *Staff*

255. Tests and Measurements. Measurement of abilities, personality, and achievement. Tests and other instruments for evaluating individual and program performance. One course. *Page*

276. The Teaching of High School Science. Discussion, lectures, and collateral reading related to such topics as aims, tests, curriculum, classroom and laboratory procedures, field trips, and course and lesson planning for secondary school science. One course. *Staff*

COURSES CURRENTLY UNSCHEDULED

104. The School as an Organization

119. The Governance and Administration of Education

203. Seminar in Philosophical Analysis of Educational Concepts

206. Studies in the History of Educational Philosophy

217. Psychological Principles of Education

226. Teaching Developmental and Remedial Reading in the Elementary School

230. Research Methods

234. Secondary School Organization and Administration

241. Counseling Psychology

248. Practicum in Counseling

258. Assessment of Personality, Interests, and Attitudes

260. Educational Research I

261. Educational Research II

262. Educational Research III

267. Energy Use in Educational Facilities

270. Junior and Community College

271. Instructional Systems for College and University Teaching

277. Student Personnel Services in Higher Education

UNIVERSITY PROGRAM FOR PREPARATION FOR TEACHING*

Duke University offers programs to prepare students to meet certification requirements for teaching in either elementary or secondary schools, although no

*Duke University is accredited by the National Council for Accreditation of Teacher Education for the preparation of elementary and secondary school teachers. The programs are also approved by the North Carolina Department of Public Education.

major is offered in education. Prerequisites for all prospective teachers are Psychology 11 and Education 100 or 113. Special materials and methods courses should be taken in the education programs and other appropriate departments prior to undergraduate student teaching, which is part of a planned professional semester in the senior year. Only students with a C average or higher overall and in the major and teaching fields will be admitted to student teaching.

Secondary School Teaching

Prospective secondary school teachers must major in a subject other than education. They must, however, consult the appropriate adviser in education prior to each registration period to assure that they will be eligible to enter the required student teaching program. Students preparing to teach in a secondary school must meet certification requirements by qualifying in one teaching field. Qualifications for certification to teach a single science may be sought under either the Bachelor of Arts or the Bachelor of Science degree.

Elementary School Teaching

This program is designed for those students with other majors who desire to meet certification requirements for teaching in elementary schools.

Required General Courses

English	1 course
Natural Science	2 courses
Mathematics	1 course
Social Science (anthropology, economics, geography, history, political science, or sociology)	3 courses from at least two fields
Literature	1 course
Physical Education Activity	2 half courses or equivalent
Psychology	1 course

Required Specialized Subject Matter Courses

Physical Education (for early childhood or intermediate grades)	half course
Health Education 134	half course
Music Education 151, 152	1 course
Education 161, 162	1 course
Education 105	half course
Education 106	half course
Education 107	half course
Education 108	half course

Required Professional Courses

Education 100	1 course
Education 118	1 course
Education 195S	half course
Education 196	1 and one-half courses

The certification sequence in elementary education must include a concentration of at least six courses in subjects commonly taught in elementary school, chosen from one of the divisions—humanities, natural sciences, or social sciences. The concentration may include courses from the general education requirement.

English (ENG)

Professor G. Williams, *Chairman*; Associate Professor Gerber, *Director of Undergraduate Studies*; Associate Professor Butters, *Supervisor of Freshman Instruction*; Professors Anderson, Budd, Cady, Duffey, Ferguson, Gleckner, Monsman, Nygard, Price, Randall, Ryals, Smith, and K. Williams; Associate Professors Applewhite, Clum, Dearlove, DeNeef, Jackson, Jones, Mellown, and Strandberg; Assistant Professors Gaines, Pope, Porter, and Torgovnick

WRITING AND LANGUAGE

1. Freshman Composition. Weekly expository themes based on British and American prose. One course. *Staff*

2. The Art of Expository Writing. Fulfills composition requirement for especially talented freshman writers. Interested students must submit a writing sample to the Department of English during the summer before matriculation. (See *Academic Guide for Freshmen*.) Prerequisite: consent of Supervisor of Freshman Instruction in English. One course. *Staff*

10. Introductory Composition and Literature. A skills course in composition and literature (contemporary essays and short stories), with frequent writing assignments; regular individual conferences. (This course, offered in the Summer Transitional Program, does not satisfy the requirement for proficiency in English composition.) One course. *Staff*

12. Intermediate Composition. The grammar and mechanics of expository writing. Frequent writing assignments. Priority given to freshmen, then sophomores. One course. *Staff*

28S. Introduction to Creative Writing. Prerequisite: consent of instructor. One course. *Staff*

29. This number represents one course credit for advanced placement on the basis of the College Board examination in Composition and Language.

61S. Writing: Prose Fiction and Drama. Prerequisite: consent of instructor. One course. *Staff*

62S. Writing: Poetry. Prerequisite: consent of instructor. One course. *Staff*

101S. Advanced Expository Writing. Techniques of effective writing. Priority given to seniors, then juniors. One course. *Staff*

103S, 104S. Writing: Short Stories. Class discussion of students' manuscripts; individual conferences with the instructor. Open to sophomores, juniors, and seniors. Interested students should present a piece of writing to the instructor as early as possible during the preceding term. Two courses. *Applewhite, Pope, or Price*

105S. Writing: Longer Prose Narrative. The writing of a novel or novella or a group of short stories. Primarily for juniors and seniors. Prerequisite: consent of instructor before preregistration. One course. *Price*

106S. The Writing of Poetry. Meter, image, tone, and dramatic organization in traditional and modern poems as a basis for original composition. Prerequisite: consent of instructor. One course. *Applewhite*

107S. Writing: Drama. Scripts for the stage, screen, and television. Prerequisite: consent of instructor. C-L: Film. One course. *Staff*

109S. Special Topics in Writing. Advanced work for majors who have taken at least two previous 100-level writing courses. Prerequisite: consent of instructor. One course. *Staff*

111. Introduction to Linguistics. Origin and nature of language; methods of descriptive linguistics with reference to historical and comparative linguistics. C-L: Anthropology 107 and Linguistics. One course. *Staff*

112. English Historical Linguistics. Introduction to methods and principles of historical linguistics, as exemplified by the history of the English language from Proto-Indo-European to the present. C-L: Linguistics. One course. *Butters or Nygard*

115. Present-Day English. Origins, development, and current structure of English, especially in America. Transformational versus traditional and structural

grammar, written versus spoken English, social and regional dialects. C-L: Linguistics. One course. *Butters or Nygard*

119S. Special Topics in Language. Advanced study of an area of linguistics or grammar. One course. *Butters or Nygard*

INTRODUCTION TO LITERATURE

20. This number represents one course credit for advanced placement on the basis of the College Board examination in Literature and Composition.

21S. Studies in the Novel. One course.

22S. Studies in Drama. One course.

23S. Studies in the Short Story. One course.

24S. Studies in Poetry. One course.

25S. Studies in the Epic. One course.

26S. Studies in Special Topics. May be taken twice. One course.

51, 52. Representative American Writers. Selections and complete works. 51: Poe, Emerson or Thoreau, Hawthorne, Melville, Whitman, Dickinson, and Twain; not open to students who have taken English 152 or 153. 52: James, Frost or Robinson, Crane or Dreiser, O'Neill, Faulkner, Hemingway, and others. Not open to students who have taken English 153 or 154. Two courses. *Staff*

91. Introduction to the Study of English Literature. Methods of literary analysis through the study of selected works of Chaucer, Shakespeare, Pope, and Wordsworth. Not open to students who have taken English 55 or 56. One course. *Staff*

93. Introduction to the Study of Literary Genre. An introduction, through selected poetry, fiction, and drama, to the distinctive nature of each major genre and to the critical procedures for examining that genre. One course. *Staff*

ENGLISH AND BRITISH LITERATURE

121. Medieval English Literature to 1500. The principal forms and examples of English prose, poetry, and drama of the Anglo-Saxon and Middle English periods (excluding Chaucer). In translation. C-L: Medieval and Renaissance Studies. One course. *Nygard*

122. Sixteenth-Century English Literature. Emphasis in poetry on Wyatt, Sidney, Spenser, Raleigh, Shakespeare; in prose on Sidney and Sir Thomas More; in drama on Marlowe. C-L: Medieval and Renaissance Studies. One course. *DeNeef*

123. English Literature: 1600 to 1660. Emphasis in poetry on Jonson and the cavaliers, Donne and the metaphysicals; in drama on Jonson, Tourneur, Webster, Ford; in prose on character writers, Bacon, Burton, Donne, Browne. C-L: Medieval and Renaissance Studies. One course. *DeNeef or Randall*

124. English Literature: 1660 to 1800. Major genres and authors such as Dryden, Congreve, Addison, Swift, Pope, Gray, Johnson, Blake, and Defoe or Fielding. One course. *Ferguson or Jackson*

125. English Literature of the Romantic Period. Wordsworth, Coleridge, Byron, Shelley, Keats. One course. *Applewhite or Gleckner*

126. English Literature: 1832 to 1900. Major writers and genres, with special emphasis on Carlyle, Tennyson, Browning, Arnold, the pre-Raphaelites, and Hopkins. Collateral reading from novels. One course. *Monsman or Ryals*

127, 128. Twentieth-Century British Literature. Emphasis on principal writers of fiction, drama, and poetry. 127: usually Conrad, Shaw, Yeats, Wells, Synge, Forster, Woolf, and Joyce. 128: usually Lawrence, Cary, Huxley, Auden, Greene, Beckett, and Dylan Thomas. Two courses. *Dearlove, Mellown, Pope, or Smith*

131. Studies in a Single British Author. One course. *Staff*

133. Modern British Drama. O'Casey, Coward, Eliot, Osborne, Pinter, Beckett, Stoppard, and others. C-L: Drama 148. One course. *Clum*

135. British Poetry of the Twentieth Century. Changes in poetry and its criticism from the Edwardians. Yeats, Housman, Lawrence, Owen, the Sitwells, Graves, Auden, MacNeice, Dylan Thomas, Hughes, and Larkin. One course. *Dearlove, Mellown, Pope, or Smith*

136. Eighteenth-Century British Novel. Defoe, Richardson, Fielding, Smollett, and Sterne; the Gothic novel. One course. *Ferguson or Jackson*

137. Nineteenth-Century British Novel. Scott, Austen, Dickens, Thackeray, Trollope, the Brontës, George Eliot, Meredith, Butler, Hardy, and others. One course. *Monsman or Ryals*

138. Twentieth-Century British Novel. Conrad, Lawrence, Forster, Joyce, Woolf, Huxley, Cary, Amis, and Golding. One course. *Dearlove, Mellown, Pope, or Smith*

139S. Special Topics in British Literature. One course. *Staff*

Major Authors

141. Chaucer. Focus on *The Canterbury Tales* and its literary and social background. C-L: Medieval and Renaissance Studies. One course. *DeNeef or Nygard*

143, 144. Shakespeare. 143: twelve plays before 1600. 144: usually ten plays after 1600. C-L: Drama 141, 142 and Medieval and Renaissance Studies. Two courses. *DeNeef, Jones, Porter, or G. Williams*

145. Milton. Poetry and its literary and social background. C-L: Medieval and Renaissance Studies. One course. *DeNeef or Price*

AMERICAN LITERATURE

151. American Literature to 1820. Colonial authors such as Bradford, Taylor, Cotton Mather, Edwards, Byrd, and Franklin, and authors of the early Republic such as Tyler, Freneau, and C. B. Brown. One course. *Jones*

152. American Literature: 1820 to 1860. Prose and poetry of American romanticism: Emerson, Thoreau, Hawthorne, Poe, Melville, and Whitman. (Not open to students who have taken English 51.) One course. *Staff*

153. American Literature: 1860 to 1915. Dickinson, Twain, James, the social and philosophical essayists, Crane, Dreiser, Robinson, and Frost. (Not open to students who have taken English 52.) One course. *Staff*

154. American Literature: 1915 to 1960. Eliot, Fitzgerald, Hemingway, Faulkner, and others. (Not open to students who have taken English 52.) One course. *Staff*

155. Contemporary American Writers. Novelists and poets prominent since 1960. One course. *Duffey or Strandberg*

157, 158. American Literature and Culture. Relationship of literature to the other arts, American intellectual history, religion, and science and technology. 157: to the Civil War. 158: from the Civil War to 1960. Two courses. *Cady*

161. Studies in a Single American Author. One course. *Staff*

162. Twentieth-Century American Drama. Representative plays by O'Neill, Odets, Williams, Miller, Albee, Lanford Wilson, and others. C-L: Drama 146. One course. *Clum*

163. Twentieth-Century American Poetry. The classicism of Pound, Eliot, and the Fugitives in relation to the neoromanticism of Stevens, Williams, Crane, and Roethke. Developments during World War II and after: Lowell, Jarrell, Berryman, Dickey, Levertov, and Wright. One course. *Applewhite, Duffey, or Pope*

164, 165. American Fiction. A survey of the novel and the short story. 164: the nineteenth century, Poe, Hawthorne, Melville, Twain, James, and others. 165: the twentieth century, Hemingway, Faulkner, Fitzgerald, Barth, Pynchon, and others. Two courses. *Clum, Strandberg, or K. Williams*

167, 168. Afro-American Literature. 167: oral and written literary traditions from the American colonial period into the nineteenth century, including the spiritual as lyric poetry and the slave narrative as autobiography. 168: the late nineteenth and the twentieth centuries, Paul Laurence Dunbar to Cyrus Colter. C-L: Afro-American Studies 173, 174. Two courses. *K. Williams*

169S. Special Topics in American Literature. One course. *Staff*

GENRE AND WORLD LITERATURE

170. Theory of Genre. Introduction to literary genre and the critical questions raised about literature when examined from a generic perspective. One course. *DeNeef or Jackson*

171. Studies in a Genre. One course. *Staff*

173. Legend and Literature. Classical, Celtic, and/or Germanic legends and their places in English and American literature. One course. *Torgovnick*

174. The Origins and Aims of Narrative. Readings in ancient, middle, and modern narrative literature—epic, tale, drama, novel—with attention to the origins of its narrative impulse, its evolution from sacred to secular, its deducible purposes, and its present manifestations. One course. *Price*

175. The Bible as Literature. Selected books of Old and New Testament and Apocrypha, emphasizing their literary form and artistry and their various expressions in world literature. One course. *Staff*

179S. Special Topics in a Literary Genre. Half course (summer only) or one course. *Staff*

182. Western Drama, Classical to Neoclassical. Continental and British theater and drama from the fifth century B.C. to A.D. 1800: Aeschylus to Racine. C-L: Drama 143 and Medieval and Renaissance Studies. One course. *Clum*

183. Western Drama from 1800 to 1914. Continental, British, and American drama. Wilde, Shaw, Ibsen, Chekhov, Strindberg, Herne, Moody, and others. C-L: Drama 144. One course. *Clum*

184. Modern Continental Drama. Kaiser, Brecht, Sartre, Genet, Pirandello, Ionesco, and others. C-L: Drama 145. One course. *Clum*

186. Canadian Literature in English. Eighteenth century to the present. Emphasis on the twentieth century and on novels by Hugh MacLennan, Margaret Laurence, Mordecai Richler, Margaret Atwood, Rudy Wiebl, and others. One course. *Staff*

187. Readings in European Literature. Major works of European literature and their influence on English and American literature: Montaigne, Rabelais, Cervantes, Voltaire, Dostoevsky, and others. One course. *Staff*

191, 192, 193, 194. Independent Study. Directed reading and research. Students should consult the Director of Undergraduate Studies as early as possible in the preceding term. Up to one course each. *Staff*

195T. Tutorial. Directed reading and research. Students should consult the Director of Undergraduate Studies as early as possible in the preceding term. One course. *Staff*

SPEECH AND FILM

71. Essentials of Public Speaking. Designed to give the student practice in making oral presentations with particular attention to the gathering and organization of speech materials. Not open ordinarily to juniors and seniors. One course. *Staff*

72. Essentials of Public Speaking. Similar to English 71, but for juniors and seniors. Not open to students who have taken English 71. One course. *Staff*

73S. Argumentation. Analysis, investigation, evidence, reasoning, brief making, and refutation. Class debates. Prerequisite: consent of instructor. One course. *Staff*

74. Persuasive Speaking. The psychological and sociological techniques used in gaining acceptance of ideas through speech. Factors influencing human behavior; audience analysis and motivation; choice, arrangement, and adaptation of material. Extensive practice in persuasive speaking. One course. *Staff*

81. Introduction to Film. C-L: Drama 81 and Film. Half course (summer only) or one course. *Clum or Gaines*

82. The American Film. C-L: Drama 82 and Film. One course. *Clum or Gaines*

188. Literature and Film. Film versions of novels, short stories, and plays including *Wuthering Heights*, "The Swimmer," *The Trial*, *Who's Afraid of Virginia Woolf*. C-L: Drama 188 and Film. One course. *Clum or Gaines*

189S. Special Topics in Film. A major genre, period, or director. Prerequisite: English 81. C-L: Film. One course. *Clum or Gaines*

RELATED TOPICS

27S. Studies in Nonliterary Topics. May be taken twice. *Staff*

98. College Sports and American Culture. Sports, especially football and basketball, in relation to other aspects of American culture; including literature and other arts both "high" and "popular," ideas, and aspects of the American Dream. One course. *Cady*

For Juniors, Seniors, and Graduates

207. Old English Language and Literature. The pre-Conquest language and representative prose and poetry. C-L: Linguistics and Medieval and Renaissance Studies. One course. *Nygard*

208. History of the English Language. Introductory survey of the changes in sounds, forms, and vocabulary of the English language from its beginning to the present, with emphasis on the evolution of the language as a medium of literary expression. C-L: Linguistics and Medieval and Renaissance Studies. One course. *Butters or Nygard*

209. Present-Day English. A survey of contemporary linguistic theories applied to modern English; designed for students of literature and teachers of English. C-L: Linguistics and Medieval and Renaissance Studies. One course. *Butters or Nygard*

212. Middle English Literature: 1100 to 1500. Selected topics. C-L: Medieval and Renaissance Studies. One course. *Nygard*

221. Renaissance Prose and Poetry: 1500 to 1660. Selected topics. C-L: Medieval and Renaissance Studies. One course. *DeNeef, Randall, or G. Williams*

225. Renaissance Drama: 1500 to 1642. Selected topics. C-L: Medieval and Renaissance Studies. One course. *Randall or G. Williams*

235. Restoration and Eighteenth-Century Literature: 1660 to 1800. Selected topics. One course. *Ferguson or Jackson*

245. Victorian Literature: 1830 to 1900. Selected topics. One course. *Monsman or Ryals*

251. British Literature since 1900. Selected topics. One course. *Mellown or Smith*

263. American Literature to 1865. Selected topics. One course. *Anderson or Jones*

267. American Literature: 1865 to 1915. Selected topics. One course. *Budd, Cady, or K. Williams*

275. American Literature since 1915. Selected topics. One course. *Duffey or Strandberg*

287. Major Critical Thought. A study of major figures in the history of literary criticism. One course. *Duffey*

COURSES CURRENTLY UNSCHEDULED

181S. Studies in a Single World Author

185. Major Western Authors

241. Romantic Literature: 1790 to 1830

280. Introduction to Folklore

THE MAJOR

Basic Requirements. English 91 or 93.

Major Requirements. Eight courses on or above the 100 level, to be organized into one of the coherent plans of study listed below. Each plan of study contains an appropriate seminar and one course in each of four areas: (1) in a major author; (2) in English or British literature before 1800; (3) in English or British literature after 1800; and (4) in American literature. The period requirements may also be satisfied by pertinent courses in a literary genre.

1. *English Literature:* four courses in English or British literature to include at least one course before 1800 and one course after 1800; one course in American literature; one course in a major author (Chaucer, Shakespeare, or Milton); one seminar in English or British literature; and one elective.*
2. *American Literature:* four courses in American literature, including a seminar; one course in English or British literature before 1800; one course in English or British literature after 1800; one course in a major author (Chaucer, Shakespeare, or Milton); and one elective.*
3. *Studies in Literary Genre:* three courses in literary genre, including a seminar; one course in English or British literature before 1800; one course in

*English 112 and 115 are recommended supplements to the major's plan of study.

*English 112 and 115 are recommended supplements to the major's plan of study.

English or British literature after 1800; one course in American literature; one course in a major author (Chaucer, Shakespeare, or Milton); and one elective.* English/drama double majors should take Studies in a Literary Genre with drama as their concentration.

4. *Writing*: four courses in writing; one course in English or British literature before 1800; one course in English or British literature after 1800; one course in American literature; and one course in a major author (Chaucer, Shakespeare, or Milton).

Courses which fulfill area requirements:

English or British literature before 1800: 121, 122, 123, 124, 131 (when before 1800), 136, 139S (when before 1800), 141, 143, 144, 145, 212, 221, 225, 235.

English or British literature after 1800: 125, 126, 127, 128, 131 (when after 1800), 133, 135, 137, 138, 139S (when after 1800), 241, 245, 251.

American literature: 151, 152, 153, 154, 155, 157, 158, 161, 162, 163, 164, 165, 167, 168, 169S, 263, 267, 275.

Studies in a Major Author: 141, 143, 144, 145.

Literary Genre: 131 (when appropriate), 133, 135, 136, 137, 138, 139S (when appropriate), 141, 143, 144, 145, 161 (when appropriate), 162, 163, 164, 165, 169S (when appropriate), 170, 171, 173, 174, 175, 179S, 181S (when appropriate), 182, 183, 184, 225.

Writing: 101S, 103S, 104S, 105S, 106S, 107S, 109S.

Foreign Languages. The department recommends that students majoring in English complete at least two years of college level study, or the equivalent, of a foreign language. Students contemplating graduate work in English should note that many master's programs require examination in one foreign language and that doctoral programs commonly require examination in two.

Honors. The department offers work leading to graduation with distinction. For further information consult the Director of Undergraduate Studies and the section on honors in this bulletin.

Film

For courses in Film, see Institute of the Arts.

Forestry and Environmental Studies (FES)

Students who are preparing for professional careers in natural resources and the environment should refer to the section on undergraduate-professional combination programs in this bulletin. The courses listed below are described fully in the *Bulletin of Duke University: School of Forestry and Environmental Studies*. They are open to undergraduates by consent of the instructor.

191, 192. Independent Study. Directed reading and research. (Open to qualified juniors and seniors with consent of the student's major adviser and the instructor.) Credit to be arranged. *Staff*

194. Conserving Natural Resources. One course. *Royer*

201. Field Studies. Credit to be arranged. *Staff*

202. Student Projects. (Open to qualified juniors and seniors with consent of the student's major adviser and of the School of Forestry and Environmental Studies.) Credit to be arranged. *Staff*

207. Biology of Forest Insects and Diseases. One course. *Slambaugh*

211. Resource Ecology and Ecosystem Analysis. One course. *Richardson*

212. Ecosystem Dynamics in Silviculture. One course. *Boyce*

213. Silviculture. Prerequisite: Forestry and Environmental Studies 211 or equivalent. One course. *Davis*

214. Tree Biology. One course. *Barnes*

215. Forest Entomology. Prerequisites: senior status and Forestry and Environmental Studies 207 or consent of instructor. One course. *Staff*

216. Forest Pathology. Prerequisite: Forestry and Environmental Studies 207 or consent of instructor. One course; one and one-half courses with laboratory. *Stambaugh*
- 220L. Soil Classification and Interpretation. One course. *Ralston*
- 221L. Silvics and Measurement of Forest Vegetation. One course. *Davis*
224. Ecological Toxicology. One course. *Di Giulio*
226. Forest Ecosystems. One course. *Binkley*
230. Weather and Climate. One course. *Knoerr*
231. Environmental Climatology. One course. *Staff*
232. Microclimatology. One course. *Knoerr*
234. Watershed Hydrology. One course. *Marin*
236. Water Quality Management. One course. *Reckhow*
238. Limnological Principles of Aquatic Resource Management. Prerequisite: a course in aquatic ecology or consent of instructor. One course. *Staff*
252. Computer Applications in Forestry. Half course. *Vasievich*
256. Remote Sensing for Resource Management. One course. *Davison*
259. Computer Programming for Resource Management. Offered only in first half of semester. Prerequisite: calculus. Half course. *Boyd*
260. Natural Resource Data Analysis. Offered in second half of semester. Prerequisite: calculus. Half course. *Jayne and Reckhow*
262. Applied Population Ecology. One course. *Staff*
263. Harvesting and Transportation Systems. Offered only in first half of semester. Half course. *Jayne*
264. Manufacturing Systems. Offered in second half of semester. Half course. *Jayne*
270. Resource Economics and Policy. Prerequisite: introductory course in microeconomics or consent of instructor. One course. *Hyde*
283. Environmental Policy and Values. Prerequisite: consent of instructor. One course. Fall. *Royer*
290. Practicums in Resource Management. Prerequisite: consent of instructor prior to registration. One course. *Staff*

French

For courses in French, see Romance Languages.

Genetics—The University Program

Professor Gillham, *Director*, (zoology); Professors Amos (immunology), Antonovics (botany), Boynton (botany), Burns (microbiology), Counce (anatomy), Gross (biochemistry), Guild (biochemistry), Joklik (microbiology), Kredich (medicine and biochemistry), Moses (anatomy), Nicklas (zoology), C. Ward (zoology), F. Ward (immunology), and Webster (biochemistry); Associate Professors Bastia (microbiology), Greene (biochemistry), and Modrich (biochemistry); Assistant Professors Burdett (microbiology), Endow (microbiology), Greenleaf (biochemistry), Hershfield (medicine and biochemistry), Holmes (medicine and biochemistry), Hsieh (biochemistry), Schachat (anatomy), Steege (biochemistry), and Uyenoyama (zoology); Adjunct Professors Drake (National Institute of Environmental Health Sciences), Judd (National Institute of Environmental Health Sciences), and Lucchesi (University of North Carolina)

The University Program in Genetics provides a coherent course of study in all facets of biology related to genetics. Students interested in preparation for advanced work in genetics or wishing to take an interdisciplinary major in this area should consult Dr. Gillham (0082 Biological Sciences Building). Information concerning interdisciplinary programs involving biology should be discussed with the appropriate Directors of Undergraduate Studies.

For descriptions of the courses consult the listings under the specified departments.

Introduction to Genetics. (Zoology 117.) One course. *Ward*

Principles of Genetics. (Botany 180, Botany 280, Zoology 180, and Zoology 280.) One course. *Antonovics, Boynton, and Gillham*

Molecular Genetics I: Genetic Mechanisms. (Biochemistry 215.) One course. *Gross and staff*

Chromosomes, DNA, and Evolution. (Microbiology 264S and Zoology 264S.) One course. *Endow and Nicklas*

Molecular Biology II: Nucleic Acids. (Biochemistry 268.) One course. *Staff*

Extrachromosomal Inheritance. (Botany 283 and Zoology 283.) One course. *Boynton and Gillham*

Ecological Genetics. (Botany 285S.) One course. *Antonovics*

Evolutionary Mechanisms. (Botany 286 and Zoology 286.) One course. *Antonovics and H. Wilbur*

Independent Study and Special Problems. (Botany 191, 192, 193, 194, 225, and 226; Zoology 191, 192, 193, and 194.) Prerequisites: consent of instructor and the appropriate Director of Undergraduate Studies prior to registration.

Geology (GEO)

Professor Perkins, *Chairman*; Assistant Professor Baker, *Director of Undergraduate Studies*; Professors Heron and Pilkey; Associate Professor Rosendahl

1. Introductory Geology. Survey of earth's composition and processes modifying its internal structure and surface configuration. Not open to those who have completed Geology 3 or 100. One course. *Heron or Perkins*

3. Environmental Geology. Earth processes and materials, as related to humans. Includes field trip and eight hours of mini-lab. Not open to those who have completed Geology 1 or 100. One course. *Heron*

10. Analysis of Outcrops. Field interpretation of geologic features. Includes four field trips. Prerequisite: Geology 1 or 3 (may be taken concurrently). Half course. *Staff*

53. Introductory Oceanography. Basic principles of physical, chemical, biological, and geological oceanography. Prerequisite: one course in a laboratory science. C-L: Botany 53. One course. *Pilkey and Searles*

72. History of the Earth. Physical and biological evolution of the earth from the viewpoint of global tectonics. Primarily for science majors. Fee for field trips. Weekend field trip through the Appalachians, and Saturday field trip through the Deep River Triassic Basin. Prerequisite: Geology 1 or consent of instructor. One course. *Staff*

101. Crystallographic and Optical Mineralogy. The crystalline state, lattice concepts, indices, systems, morphology, and classification; light optics theory and its application to mineral structures. Lectures and laboratory. Prerequisite: Chemistry 11 (may be taken concurrently). One course. *Staff*

102. Fundamentals of Mineralogy. Crystal chemistry, crystal physics, mineral identification, and genesis. Lectures or recitations, laboratory, and field trips. Prerequisites: Chemistry 12 (may be taken concurrently) and Geology 101. One course. *Staff*

106. Igneous and Metamorphic Rocks. Silicate mineralogy, theory of origin and classification of igneous and metamorphic rocks, and rock identification. Lectures and laboratory. Prerequisite: Geology 102. One course. *Staff*

108. Sedimentary Rocks. Authigenic and detrital minerals, theory of origin and classification of sedimentary rocks, and rock identification. Lecture, laborato-

ry, and field trips. Prerequisite: Geology 72 or 101 or consent of instructor. One course. *Heron*

191, 192. Independent Study. Directed reading or research. Open only to qualified juniors and seniors by permission of the Director of Undergraduate Studies and supervising instructor. Two courses. *Staff*

195. Independent Study for Nonmajors. Open to qualified juniors and seniors upon approval of the departmental faculty. One course. *Staff*

For Advanced Undergraduates and Graduates

200. Beach and Coastal Processes. The study of sediments, sedimentary processes, and geomorphology of nearshore environments. One course. *Pilkey*

205. Geological Oceanography. Broad geologic aspects of the ocean basins including origin, bottom physiography, sediment distribution, and sedimentary processes. Field observations; sampling procedures. Not open to students who have completed Geology 206S. (Given at Beaufort.) One and one-half courses. *Pilkey*

206S. Principles of Geological Oceanography. A survey of geological aspects of the oceans including sediment types, processes of sedimentation, geologic structures of the ocean basins, and bottom physiography. Prerequisite: Geology 108 or consent of instructor. One course. *Pilkey*

208S. Paleooceanography. Application of stratigraphic, paleontologic, and geochemical evidence in sediments to understanding ancient oceans and climates. Prerequisite: Geology 206S or consent of instructor. One course. *Baker*

211S. Stratigraphic Principles and Applications. Prerequisites: Geology 72 and 108 or consent of instructor. One course. *Perkins*

212. Carbonate Facies Analysis: Recent and Ancient. Origin, distribution, and diagenetic alteration of recent carbonate sediments and their ancient analogs. Prerequisite: Geology 211S. One course. *Perkins*

214S. Sedimentary Petrography. Descriptive and interpretive analysis of sediments and sedimentary rocks in thin section, with an emphasis on diagenesis. Prerequisite: consent of instructor. One course. *Perkins*

215. Clastics Facies Analysis: Recent and Ancient. Modern clastic depositional systems and their ancient analogs. Prerequisite: Geology 211S. One course. *Heron*

216. Field Analysis of South Florida Carbonates. Analysis of recent sediments and organisms and their Pleistocene analogs. One-week field trip. Prerequisite: Geology 211S or consent of instructor. Half course. *Perkins*

217. Field Analysis of Ancient Sedimentary Sequences. Regional analysis of ancient clastic and carbonate systems. One-week field trip. Prerequisite: Geology 211S or consent of instructor. Half course. *Heron and Perkins*

229. Economic Geology. Principles and processes involved when elements are concentrated to economic proportions in magmatic, metamorphic, hydrothermal, sedimentary, or surface environments. Prerequisite: Geology 102. One course. *Staff*

230. Principles of Structural Geology. Description, origin, and interpretation of primary and secondary geologic rock structures. Prerequisites: Geology 106 and 108. One course. *Rosendahl*

243S. Microfossils. Readings and laboratory. Prerequisite: Geology 140S or consent of instructor. One course. *Staff*

245. Invertebrate Paleozoology. Biologic and stratigraphic relationships of invertebrates and their phylogeny. Lectures and laboratory. Prerequisite: Geology 72 or consent of instructor. One course. *Staff*

247. Paleocology. Prerequisites: Geology 108 and 140S or consent of instructor. One course. *Staff*

250. Introduction to Marine Geophysics. Topics include seismic reflection and refraction, magnetics, gravity, and seismology. Prerequisite: introductory physics or consent of instructor. (Given at Beaufort.) One and one-half courses. *Rosendahl*

251. Physics of the Earth. Origin, primeval evolution, rotation, potential fields, paleomagnetism, gravity anomalies, earthquake seismology, thermal properties, internal structure of the earth, and thermodynamics of plate motions. Prerequisites: Geology 1 and Chemistry 12 and Mathematics 32 and Physics 52 or consent of instructor. One course. *Rosendahl*

252. Exploration Seismology. Elastic wave theory, reflection and refraction of acoustic waves, field methodologies, computer processing, and interpretation of seismic data. Prerequisites: Geology 1 and Mathematics 32 and Computer Science 51 and Physics 52 or consent of instructor. One course. *Rosendahl*

253S. Geophysics. Current topics. Prerequisite: consent of instructor. One course. *Rosendahl*

254. Geophysical Field Methods. Acquisition and processing of geophysical data with special emphasis on seismic techniques. Prerequisite: consent of instructor. One course. *Rosendahl*

260S. Hydrocarbon Exploration. Origin, migration, and accumulation of hydrocarbons with emphasis on exploration techniques. Prerequisites: Geology 211S and 251. One course. *Perkins and Rosendahl*

270. Geochemistry. Application of chemical principles to geological problems. Prerequisites: Chemistry 12 and Mathematics 32. One course. *Baker*

271. Low-Temperature Geochemistry. Chemistry of aqueous solutions, authigenic minerals, surface chemistry, and stable isotopes in sedimentary systems. Prerequisite: Geology 270 or consent of instructor. One course. *Baker*

COURSES CURRENTLY UNSCHEDULED

100. Physics and Chemistry of the Earth

196S. Beach and Island Geological Processes

213. Sedimentology

235S. Global Tectonics

THE MAJOR

For the A.B. Degree

Prerequisites. Geology 1 and 72; Chemistry 11 and 12; and Mathematics 31 and 32.

Major Requirements. A minimum of eight geology courses above the introductory levels, including 101, 102, 106, 108, 211S, and 230.

For the B.S. Degree

The Department of Geology offers two programs:

Geology: Preparatory to Advanced Studies in Geology

Prerequisites. Geology 1 and 72; Chemistry 11 and 12; Mathematics 31, 32; Physics 41 and 42 or 51 and 52; and Computer Science 51.

Major Requirements. A minimum of ten courses above the introductory level including 101, 102, 106, 108, 211, 230, plus a field course normally taken during the summer of the junior year.

Geology: Preparatory to Advanced Studies in Oceanography

Prerequisites. Geology 1 and 72; Geology 53 (or 206); Chemistry 11 and 12; Physics 41 and 42 or 51 and 52; Biology 14; Mathematics 31 and 32, and three courses of science electives.

Major Requirements. A minimum of seven geology courses above the introductory level, including 101, 102, 106, 108, 211S, and 230.

Germanic Languages and Literature

Associate Professor Borchardt, *Chairman*; Assistant Professor Bessent, *Director of Undergraduate Studies and Supervisor of Freshman Instruction*; Professor Phelps; Associate Professors Alt and Rolleston; Assistant Professor Rosenberg; Professor Emeritus Salinger; Visiting Professor Jantz; Part-time Instructor Lauf; Lecturers Johns and Koeppel

GERMAN (GER)

1-2. Elementary German. Practice in understanding, speaking, reading, and writing. Classroom techniques are combined with those of the language laboratory and the computer. Two courses. *Bessent and staff*

14. Intensive German. Accelerated introduction to German, combining in one semester the work of German 1-2. Classroom theory and practice with extended exposure to language laboratory and computer programmed instruction. Prerequisite: consent of Director of Undergraduate Studies. Two courses. *Bessent and staff*

63. Intermediate German. Prerequisite: German 1-2 or equivalent. One course. *Staff*

German 63 is usually followed by 100, 101, 117S, or 182.

100. Business German. Introduction to the language of commerce and industry; modes of expression for technology and marketing. Prerequisite: consent of instructor. One course. *Koeppel*

101. Introduction to German Literature. Readings from representative German authors. One course. *Bessent and staff*

103S, 104S. Undergraduate Seminars. Topics vary. Two courses. *Staff*

105. Composition. Syntax with practice in the elements of German expository style, recommended for majors. One course. *Bessent and staff*

109S. Nineteenth-Century Prose Fiction. Emphasis on shorter forms: novelle, fairy tale, legend. One course. *Bessent*

115S. Drama. Development of German drama and stagecraft from *Sturm und Drang* to Brecht's *Epic Theater*. C-L: Drama 155S. One course. *Alt*

117S, 118S. German Conversation and Composition. Primarily conversation with oral and written reports, based on works by contemporary writers of East and West Germany. Required for German majors; other students by consent of instructor. Two courses. *Bessent and staff*

125S. German Literature to World War I. Selected nineteenth- and early twentieth-century texts to explore and define elements of the modern. Kleist, Hoffmann, Büchner, Heine, Nietzsche, Thomas Mann. One course. *Alt or Rolleston*

127S. Contemporary Germany. The current literary scene in the two Germanies in its cultural, social, and political contexts. One course. *Bessent*

129. Deutsche Kulturgeschichte. An analysis of the larger historical, political, and cultural developments and their influences on present-day Germany. One course. *Staff*

130. German Life and Thought. German cultural and intellectual history. Reading and discussion in English. Taught in English. One course. *Borchardt*

131S. Goethezeit. Goethe and his contemporaries: representative texts and the philosophical background. One course. *Jantz or Phelps*

132. The Romantics. Major writers of the romantic movement (1795-1830) considered in their national and international context. One course. *Rolleston*

172. Modern German Literature in English Translation. Representative works by such writers as Mann, Kafka, Hesse, Brecht, Böll, and Grass. Taught in English. One course. *Borchardt*

181. German for Reading, I. Foundations of German grammar and syntax; emphasis on vocabulary and complex verbal structures. Not open for credit to students who have completed German 1-2 or the equivalent. One course. *Staff*

182. German for Reading, II. Advanced reading practice with intensive grammar review; scholarly and technical selections flexibly chosen to accommodate individual student needs. One course. *Staff*

191, 192. Independent Study. Directed reading and research. Open only to qualified students in the junior year, by consent of Director of Undergraduate Studies. Two courses. *Alt, Bessent, Borchardt, Phelps, Rolleston, or Rosenberg*

193, 194. Independent Study. Directed reading and research. Open only to qualified students in the senior year, by consent of the department. Two courses. *Alt, Bessent, Borchardt, Phelps, Rolleston, or Rosenberg*

For Seniors and Graduates

200S. Proseminar. Fundamental course for advanced study of German. Literary history; schools of criticism; practical exercises in interpretation; and research methods. One course. *Alt*

201S, 202S. Goethe. His life and works, in the light of his lasting significance to Germany and world literature. 201S: lyrics, prose, fiction, and selected dramas. 202S: *Faust I & II*. Two courses. *Jantz or Phelps*

205, 206. Middle High German. The language and literature of Germany's first classical period. C-L: Linguistics and Medieval and Renaissance Studies. Two courses. *Rosenberg*

207S. German Romanticism. The principal writers of the period from 1795 to 1830. One course. *Rolleston*

209S. Drama. Studies in the German-speaking theater with emphasis on the nineteenth century. One course. *Alt*

211S. Nineteenth-Century Literature. From the end of romanticism through realism. One course. *Alt*

214S. The Twentieth Century. Literature of the twentieth century presented through representative authors. One course. *Rolleston*

215S. Seventeenth-Century Literature. Leading writers of the baroque, viewed against the background of their time. C-L: Medieval and Renaissance Studies. One course. *Borchardt*

216. History of the German Language. Development of the phonology, morphology, and syntax of German from the beginnings to the present. C-L: Linguistics and Medieval and Renaissance Studies. One course. *Rosenberg*

217S. Renaissance and Reformation Literature. The period from 1400 to about 1600. C-L: Medieval and Renaissance Studies. One course. *Borchardt*

218S. The Teaching of German. A survey of modern teaching techniques: problems in the teaching of German on the secondary and college levels. Analysis and evaluation of textbooks, related audiovisual materials, and computer programs. One course. *Phelps*

219. Applied Linguistics. The application of modern linguistic principles to a systematic study of the phonetics, morphology, and syntax of modern German. C-L: Linguistics. One course. *Rosenberg*

230S. Lyric Poetry. Studies in poetry and poetic theory. From Goethe and the romantics to Rilke, Benn, and contemporary authors. One course. *Rolleston*

COURSES CURRENTLY UNSCHEDULED

11. German for Beginners

126S. German Literature since World War I

173. Goethe's Faust in English Translation

174. Brecht's Theater

213S. Hofmannsthal—Rilke—Benn

YIDDISH (YDH)

171. Yiddish Fiction in Translation. Representative works of the classics (Mendele, Peretz, Sholem Aleichem, Asch, Goldfaden) as well as of selected poets. C-L: Judaic Studies. One course. *Alt*

181, 182. Elementary Yiddish. A thorough study of elementary Yiddish grammar with reading, composition, and oral practice. No previous knowledge of German or Hebrew required. C-L: Judaic Studies. Two courses. *Alt*

COURSES CURRENTLY UNSCHEDULED

191, 192. Independent Study

THE MAJOR

Students majoring in German develop language skills in their cultural and literary context. The international and humanistic emphasis makes the German major an appropriate companion to technical and career-oriented concentrations. Numerous opportunities are available, including programs of study abroad, interdisciplinary programs, and Fulbright and German Academic Exchange Service (DAAD) scholarships.

Prerequisites. Elementary and intermediate German.

Major Requirements. Conversation and composition (German 117S, 118S or equivalent), plus six advanced courses, three of which must be at the 200 level. The following courses may not be used to fulfill major requirements: 100, 172, 173, 174, 181, 182.

Honors. Any student who is qualified (see the section on honors in this bulletin) may undertake work toward a degree with distinction in German by applying to the Director of Undergraduate Studies.

Greek

For courses in Greek, see Classical Studies.

Health, Physical Education, and Recreation

Professor Friedrich, *Chairman*; Associate Professor Spangler, *Director of Undergraduate Studies*; Professors Buehler and Falcone; Associate Professors Eddy, Harvey, LeBar, Lloyd, Raynor, Riebel, Skinner, and Woodyard; Part-time Instructor Bronner; Lecturers Harris and McCraw; Part-time Lecturer Miller

ACTIVITY COURSES

The activity courses listed below may be taken by men and women unless otherwise indicated. Each course carries a half-course credit and is given on a pass/fail basis. The maximum amount of credit that counts for the undergraduate degree is one full course, but additional courses may be taken without credit toward graduation.

10. Adapted Physical Education. Individualized programs for permanently or temporarily disabled students. Half course. *Riebel*

11. Cardiorespiratory Conditioning and Aerobics. Individualized programs in walking, jogging, running, cycling, and swimming. Half course. *Buehler*

12. Dancing for Health. Dancing for cardiovascular and physical conditioning. Half course. *McCraw*

14. Tension Control. Techniques for recognizing and reducing tension. Half course. *Riebel*

15. Weight Training. Progressive, cumulative, and measurable physical conditioning. Half course. *Riebel*

16. Endurance Swimming. Individualized programs to improve skills and fitness. Half course. *Spangler*

20. Beginning Swimming. Propulsion techniques, water safety, introduction to the five basic strokes. Half course. *Spangler*

21. Intermediate Swimming. Development of the five basic strokes, overarm side trudgen, and trudgen crawl. Half course. *Spangler*

22. Advanced Swimming. Skill development and endurance. Half course. *Spangler*

24. Lifesaving. American Red Cross Advanced Lifesaving certification. Half course. *Woodyard*

25. Water Safety Instructors Course. American Red Cross Water Safety Instructors certification. Half course. *Woodyard*

26. Scuba Diving. Half course. *Bronner*

27. Kayaking. Basic skills for kayaking in whitewater. Half course. *Harvey*

28. Canoeing. Basic skills for canoeing in whitewater. Half course. *Riebel*

30. Beginning Golf. Half course. *Eddy*

31. Intermediate and Advanced Golf. Strategy of the game and use of all clubs. Half course. *Eddy*

40. Beginning Tennis. Half course. *LeBar*

41. Intermediate Tennis. Strategy of the game and stroke development. Half course. *LeBar*

42. Advanced Tennis. Stroke development with emphasis on strategy. Half course. *LeBar*

43. Racquetball and Squash. Half course. *Skinner*

44. Badminton and Racquetball. Half course. *Skinner*

45. Advanced Racquetball. Development of competitive skills. Half course. *Skinner*

50. Boxing. Half course. *Falcone*

51. Self-Defense. Fundamentals of selected martial arts. Half course. *Falcone*

52. Fencing. Foils, épée, and saber. Half course. *LeBar*

60. Volleyball. Half course. *Wilson*

70. Folk Dancing. Dances and music, folklore, and costumes. Half course. *Wray*

71. Square Dancing. Calls and steps. Half course. *McCraw*

72. Social Dancing. Waltz, foxtrot, tango, cha-cha, rumba, jitterbug, rock, disco, and others. Half course. *Staff*

80. Elementary Equestrianism. Skills in balance seat riding: walk, trot, and canter. Half course. *Brunson*

81. Advanced Equestrianism: Hunt Seat. Cross-country and stadium jumping techniques. Half course. *Bryson*

90. Beginning Gymnastics. Introduction to floor exercises, vaulting, rings, parallel and horizontal bars, balance beam, and side horse. Half course. *Miller*

91. Advanced Gymnastics. Development of floor exercises and skills on apparatus. Half course. *Miller*

THEORY COURSES

100. Advanced First Aid and Cardiopulmonary Resuscitation. Certification in advanced first aid and CPR. Half course. *McCraw*

102. Teaching Elementary Physical Education. Theory and practice in teaching basic skills, rhythms, and games for grades K-6. Half course. *Spangler*

134. Elementary School Health. Organization of health programs, basic health problems, and teaching methods and materials for grades K-6. Half course. *McCraw*

136. Health and Fitness. Theory and practice of personal health: body mechanics, exercise, weight control, and nutrition. Recent research in sports medicine. One course. *Friedrich*

170. History of Sports. Sports from ancient to modern times with an emphasis on sports in America. One course. *Friedrich*

171. Recreation Leadership. Concepts and techniques with an emphasis on organizing recreation for special groups. One course. *Friedrich*

174. Health and the College Student. A problem-solving approach to health concerns. One course. *Friedrich*

COURSES CURRENTLY UNSCHEDULED

13. Weight Control

Hindi-Urdu

For courses in Hindi-Urdu, see Asian and African Languages.

History (HST)

Professor A. Scott, *Chairman*; Professor W. Scott, *Director of Undergraduate Studies*; Professors Cahow, Cell, Chafe, Colton, Davis, Durden, Ferguson, Franklin, Holley, Lerner, Mauskopf, Oates, Richards, TePaske, Watson, Witt, and Young; Associate Professors Bergquist, Crellin, Dirlik, Gavins, Goodwyn, Miller, Nathans, Roland, and Wood; Assistant Professors di Corcia, English, Huber, Kuniholm, Neuschel, Reddy, and Robisheaux; Professors Emeriti Parker, Preston, and Ropp; Visiting Assistant Professors Epstein, Gaspar, and McDougall; Instructor Kunst; Lecturers Bronfenbrenner and J. Scott

History courses offer students from all disciplines within the University an opportunity to investigate the past, gain perspective on the present, and improve their critical faculties. History provides an integrating principle for the entire learning process, and students of history gain a sense of human development, an understanding of fundamental and lasting social processes, and a feeling for human interrelatedness. History courses train the mind by improving skills in communicating thought and imagination.

PREREQUISITE COURSES

Students are urged, but not required, to take two prerequisite courses before proceeding to advanced-level courses. Majors take a sequence of two prerequisite courses in history (21, 22; 21S, 22S; 25, 26; 53, 54; 91, 92; 91S, 92S; or 175, 176). Additional courses may be chosen from this group as electives or part of the departmental major.

21. Europe to the Eighteenth Century. Development and world impact of European civilization, critical evaluation of historical interpretations, investigation of history from primary sources. C-L: Comparative Area Studies. One course. *Staff*

21S. Europe to the Eighteenth Century. A seminar version of History 21. One course. *Staff*

22. Europe from the Eighteenth Century. Development and world impact of European civilization, critical evaluation of historical interpretations, investigation of history from primary sources. C-L: Comparative Area Studies. One course. *Staff*

22S. Europe from the Eighteenth Century. A seminar version of History 22. One course. *Staff*

25. Introduction to World History: to 1700. The beginning and evolution of civilization; major traditions of Eurasia (Greek, Christian European, Indian, Chinese, Islamic); Africans and American Indians; the European invasion of America; foundations of the European world economy; Europe's preparation for world hegemony. C-L: Comparative Area Studies. One course. *Staff*

26. Introduction to World History: since 1700. Establishment of European political, economic, and cultural hegemony; non-Western responses; the decline of Western hegemony. C-L: Comparative Area Studies. One course. *Staff*

49S. The Intellectual History of the Twentieth Century. The leading thinkers and trends of thought in Western civilization since Sigmund Freud. One course. *Parker*

53. Greek History. C-L: Classical Studies 53. One course. *Boatwright*

54. Roman History. C-L: Classical Studies 54. One course. *Boatwright*

91. The Development of American Democracy to 1865. The trends vital to an understanding of the United States today. The development of American democracy. Problems of foreign policy, the growth of capitalism, political practices, social reform, and conflicting ideals are considered in relation to this main theme. One course. *Staff*

91S. The Development of American Democracy to 1865. Seminar version of History 91. One course. *Staff*

92. The Development of American Democracy, 1865 to the Present. A continuation of History 91 with emphasis upon the emergence of contemporary problems in the United States. One course. *Staff*

92S. The Development of American Democracy, 1865 to the Present. Seminar version of History 92. One course. *Staff*

175, 176. The Third World and the West. Economic, social, political, and cultural relationships, 1500 to the present. C-L: Comparative Area Studies. Two courses. *Staff*

UNDERGRADUATE COLLOQUIA

Colloquia are open without prerequisite to all undergraduates and are designed for the nonspecialist, although history majors may take them for credit. Each colloquium consists of reading and discussion involving an explicit historical theme. Short papers, reports, and a final examination may be required. Unlike seminars, which emphasize materials and methods of historical research, colloquia concentrate on historical literature.

101G, 102G. Introduction to Islamic Civilization. C-L: Interdisciplinary Course 162, 163. Two courses. *Richards*

101H. Science in the Twentieth Century. One course. *Mauskopf*

OTHER UNDERGRADUATE COURSES

90. Foundations of Chinese Civilization. Ethnic, spiritual, social, aesthetic, moral, political, and economic themes in China's past that underlie the contemporary experience. One course. *Kunst*

100. Early Greece and the Near East. C-L: Classical Studies 133. One course. *Oates*

103. The Roman Revolution. C-L: Classical Studies 137. One course. *Oates*

104. The Intellectual Life of Europe, 1250-1600. C-L: Medieval and Renaissance Studies. One course. *Witt*

105, 106. Political and Constitutional History of England. The origins and evolution of the principal institutions of the English government, related to their setting in a changing society. C-L, 105: Medieval and Renaissance Studies. Two courses. *Staff*

107, 108. Social and Cultural History of England. English history from the fourteenth century to the present time in an effort to arrive at a synthesis of ideas,

social conditions, and political events and thus provide a background for the study of English literature. C-L, 107: Medieval and Renaissance Studies. Two courses. *Ferguson*

109. Contemporary International Problems: Their Historical Origins and Their Implications for Future Policy. C-L: Interdisciplinary Course 109, Political Science 160, Religion 156, and Sociology 175. One course. *Staff*

110. Agrarian Insurgency and Labor Movements in the First and Third Worlds. Problems of working-class consciousness, organization, and political action, using comparative case studies from the United States and Latin America. C-L: Comparative Area Studies. One course. *Bergquist and Goodwyn*

111. Early America to 1760. Pre-Columbian explorations, European invasion of North America, the evolution of race slavery, and the responses of the native American peoples. One course. *Wood*

112. Era of the American Revolution, 1760-1815. Origins, evolution, and consequences. Attention to economic, social, and geographical questions, as well as military and political. One course. *Wood*

113, 114. The United States from the 1890s to World War II. 113: to 1920. 114: through the New Deal. Two courses. *Watson*

115, 116. History of Africa. Social, political, and economic development in tropical Africa. 115: cultural background and precolonial history. 116: colonial and contemporary times. Two courses. *Staff*

117, 118. Early Modern Europe. The economic, social, and political history of early modern Europe. Two courses. *Neuschel or Robisheaux*

119, 120. History of Socialism and Communism. The origins and development of socialist and communist movements from pre-Marxian times to the present. C-L: Comparative Area Studies. Two courses. *Lerner*

121, 122. Diplomatic History of the United States. Emphasis on those factors, foreign and domestic, that have shaped the foreign policies of the Republic. C-L: Comparative Area Studies. Two courses. *Davis*

123S. Madness and Society in Historical Perspective. Mental illness in Western society since the Enlightenment with special attention to the United States and prerevolutionary Russia. One course. *Miller*

124S. Slave Society in Colonial Anglo-America: The West Indies, South Carolina, and Virginia. The development of slave-based societies and the production of staple crops for export. One course. *Gaspar*

125. The Athenian Empire. C-L: Classical Studies 134. One course. *Oates*

126. Alexander the Great. C-L: Classical Studies 135. One course. *Oates*

127S. History and the Visual Image. Relationships between historical study and the visual image: painting, photography, films, and television. C-L: Film. One course. *Bergquist, TePaske, and Wood*

128. The United States and Latin America. Economic, cultural, political, and diplomatic relationships in the twentieth century. C-L: Comparative Area Studies. One course. *Bergquist*

129. Experiment in Republicanism: the United States, 1787-1860. One course. *Nathans*

130. From Victorian to Corporate America, 1820-1900. One course. *Nathans*

131. Mexico and the Caribbean from the Wars of Independence to the Present. C-L: Comparative Area Studies. One course. *TePaske*

132. Major South American Nations, 1850 to the Present. Comparative development of export economies of Brazil, Argentina, Colombia, Chile, and Venezuela and impact on social structure, politics, and culture. C-L: Comparative Area Studies. One course. *Bergquist*

133. Medieval Europe, 300-1000 A.D. C-L: Medieval and Renaissance Studies. One course. *Young*

134. Medieval Europe, 1000-1400 A.D. C-L: Medieval and Renaissance Studies. One course. *Young*

135. Political, Economic, and Social History of Europe, 1890-1933. The challenge of social democracy, nationalism, and the rise of fascism; World War I and the Great Depression. One course. *Colton*

136. Europe since 1933. Nazi Germany and Hitler's Europe, popular fronts and resistance movements, left-wing culture since the Spanish Civil War, the role of the United States and of decolonization on postwar stability. One course. *Colton*

141. Roots of the Chinese Revolution. China in the nineteenth and twentieth centuries with emphasis upon the economic, social, and political changes brought about by China's incorporation into the modern world system. C-L: Comparative Area Studies. One course. *Dirlik*

142. The Chinese Revolution in the Twentieth Century. The ideological and social bases of the revolutionary movement and conflicts over the direction of the revolution since 1949. C-L: Comparative Area Studies. One course. *Dirlik*

143. Traditional and Early Modern Japan. Japan from earliest settlement to 1868; the Heian Court, rise of the samurai, warring states, and the Tokugawa shogunate. C-L: Comparative Area Studies. One course. *Huber*

144. History of Modern Japan. Japan from 1868 to the present; the Meiji Restoration, industrialization, the new literature, the Great Pacific War, and the "Economic Miracle." C-L: Comparative Area Studies. One course. *Huber*

145, 146. Afro-American History. The black experience in America from slavery to the present. C-L: Afro-American Studies 145, 146. Two courses. *Gavins*

147. History of Weapons. The technology of war from the earliest times to the present, with emphasis on Western experience. One course. *Roland*

148. History of Nuclear Energy. The development and exploitation of nuclear energy for both military and civilian uses. One course. *Roland*

149. Military History. War, politics, and technology. One course. *Roland*

150S. U. S. Constitutional History. One course. *Cahow*

151. History of Technology. From primitive arts and crafts to the present, with emphasis on Western technology and its relationship to science and society. One course. *Roland*

152. The Decline and Fall of the Roman Empire. C-L: Classical Studies 138. One course. *Oates*

153S. The Insurgent South. C-L: Interdisciplinary Course 153S. Prerequisite: consent of instructor. One course. *Goodwyn*

154. Comparative Study of Revolutions. Marxist and other theories of revolution; case studies of the English, French, Russian, and Chinese revolutions. One course. *Cell*

155. **Modern Mexico.** C-L: Spanish 122. One course. *TePaske and Fein*
156. **Justice and Society.** A historical-philosophical approach to justice as a philosophic ideal and an examination of historical attempts to realize that ideal. Readings from literature as well as philosophy and history. C-L: Philosophy 156. One course. *Goodwyn and Wartenberg*
- 157, 158. **The Rise of Modern Science.** The development of science and medicine, with attention to cultural and social influences upon science. 157: through Newton. 158: eighteenth to twentieth centuries. Two courses. *Mauskopf*
- 159S. **The Palestine Problem and United States Public Policy.** C-L: Comparative Area Studies and Public Policy Studies 175S. One course. *Kuniholm*
160. **The United States from the New Deal to the Present.** One course. *Chafe*
- 161, 162. **History of Modern Russia.** 161: origins of Kievan Russia in the ninth century through the reign of Catherine the Great (1762-1796), concentrating on the formation of the imperial state, class elites, and psychological interpretations of the rulers. 162: nineteenth and early twentieth century to the death of Lenin, stressing the opposition movements in society. C-L: Comparative Area Studies. Two courses. *Lerner or Miller*
- 167S. **United States and Canadian Constitutional Issues.** A comparative study of the development of federalism. One course. *Cahow*
- 169, 170. **The Social History of American Women.** Two courses. *A. Scott*
171. **A History of Women in Europe.** Women in Europe since medieval times, with particular attention to economic, social, and intellectual experience. One course. *Neuschel*
- 172A. **Contemporary Science: Issues and Challenges.** One course. *Mauskopf*
- 172B. **Contemporary Technology: Issues and Challenges.** One course. *Mauskopf*
173. **History of Spain from Late Medieval Times to the Present.** Development of the Spanish nation-state from the times of Ferdinand and Isabella, Charles V, and Philip II to the Franco regime and its aftermath. C-L: Comparative Area Studies. One course. *TePaske*
174. **History of Colonial Hispanic America from Pre-Columbian Times to the Wars of Independence.** The pre-Columbian cultures, European conquest and its effects on the Amerindian peoples, and development of the Spanish and Portuguese Empires to the wars of independence, with special emphasis upon colonial institutions and socio-economic developments. C-L: Comparative Area Studies. One course. *TePaske*
178. **American Diplomacy during World War II and the Early Cold War: 1939-1961.** C-L: Comparative Area Studies. One course. *Davis or Kuniholm*
- 179S, 180S. **Bourbon, Revolutionary, and Napoleonic France.** Development of the Bourbon monarchy and social self-conceptions; cause, patterns, and meanings of the Revolution; Napoleon's relation to Bourbon and Republican France and to Europe. Prerequisite for 180S: 179S. Two courses. *di Corcia*
- 181, 182. **The Development of Modern Medicine.** 181: to 1800 with concentration on seventeenth and eighteenth centuries. 182: nineteenth and twentieth centuries. Two courses. *Crellin*
- 183S. **Canada from the French Settlement.** Problems in the development of Canada and its provinces. C-L: Canadian Studies. One course. *Preston*

184. An Introduction to Canada and Canadian Issues. C-L: Interdisciplinary Course 184. One course. *Leach*

185. American Diplomacy from the Kennedy Administration to the Present. C-L: Public Policy Studies 185. One course. *Davis or Kuniholm*

187. History of Nuclear Energy: Civilian Applications. Development and exploitation of nuclear energy for civilian uses, from the earliest scientific theories of nuclear physics through the breeder reactor. C-L: Engineering 187. One course. *Petroski and Roland*

188. History of Nuclear Energy: Military Applications. Development and exploitation of nuclear energy for military uses, from the earliest scientific theories of nuclear physics through the neutron bomb. C-L: Engineering 188. One course. *Petroski and Roland*

193, 194. Introduction to the Civilizations of Southern Asia. C-L: Interdisciplinary Course 101, 102. Two courses. *Lawrence and staff*

199. Archaeological Field School. Theories and methods of historical archaeology in the field: North Carolina, late colonial to antebellum. One course. *Wood*

For Seniors and Graduates

Students may receive credit for either semester of a hyphenated course at the 200 level without taking the other semester if they obtain written consent from the instructor.

201S. Aspects of Change in Prerevolutionary Russia. Origin and dynamics of the Russian revolutionary movement, the intelligentsia, and the emergence of the labor movement. C-L: Comparative Area Studies. One course. *Miller*

205S. The Progressive Era in the United States and World War I. One course. *Watson*

206S. The Nineteen-Twenties and the New Deal in the United States. One course. *Watson*

212. Recent Interpretations of United States History. A course designed to encourage a critical evaluation of major issues in United States history through examination of recent interpretations of key problems. Open only to history graduate students and seniors doing practice teaching in one of their final two semesters. One course. *Watson and staff*

213. Medicine and Society in America. Emergence of modern medical science, patterns and options for medical care, and health-related ethical issues considered in historical and contemporary American background. One course. *English*

215-216. The Diplomatic History of the United States. Not open to undergraduates who have had History 121, 122. C-L: Canadian Studies and Comparative Area Studies. Two courses. *Davis*

218S. Twentieth-Century Europe. Social and economic issues: inflation, mass unemployment, and the international economy. One course. *Staff*

219S, 220S. History of Science and Technology. The interaction of science and technology in the Western world from earliest times to the present. Two courses. *Mauskopf and Roland*

221. Problems in the Economic and Social History of Europe, 1200-1700. C-L: Medieval and Renaissance Studies. One course. *Witt*

222. Problems in European Intellectual History, 1250-1550. C-L: Medieval and Renaissance Studies. One course. *Witt*

224S. Seminar in Legal History. A study of the history of American law during a defined chronological period. One course. *Pratt (law)*

225. American Legal History. A study of the development of fundamental legal institutions, with emphasis upon the relationships between the changes in the law and other changes in American life. One course. *Pratt (law)*

226S. Seminar in Legal Biography. Biography as a form of legal history; the problems inherent in writing biography; the goals of an author of legal biography; and the constraints that may be placed on an author. One course. *Pratt (law)*

227-228. Recent United States History: Major Political and Social Movements. Two courses. *Chafe*

231S, 232S. Problems in the History of Spain and the Spanish Empire. C-L: Comparative Area Studies. Two courses. *TePaske*

234S. Political Economy of Development: Theories of Change in the Third World. See Political Science 234S. C-L: Anthropology 234S, Interdisciplinary Course 234S, and Sociology 234S. One course. *Bergquist, Gereffi, Smith, and Valenzuela*

235. The Antebellum South. The economic, political, and social aspects of life in the South, 1820-1860. One course. *Franklin*

236. The Reconstruction Era. The historiography of the Reconstruction and the problems of adjustment in the South in the postwar years. One course. *Franklin*

237S. Europe in the Early Middle Ages. C-L: Medieval and Renaissance Studies. One course. *Young*

238S. Europe in the High Middle Ages. C-L: Medieval and Renaissance Studies. One course. *Young*

239. History of Socialism and Communism. Origins and development of socialist and communist movements. C-L: Comparative Area Studies. One course. *Lerner*

243-244. Marxism and History. Two courses. *Dirlik*

247. History of Modern India and Pakistan, 1707-1857. Analysis and interpretation, with special emphasis on social and economic change. C-L: Comparative Area Studies. One course. *Richards*

248. History of Modern India and Pakistan, 1857 to the Present. C-L: Comparative Area Studies. One course. *Richards*

249-250. Social and Intellectual History of the United States. The interplay of ideas and social practice through the examination of attitudes and institutions in such fields as science and technology, law, learning, and religion. Two courses. *Holley*

253S, 254S. Foreign Relations of the European Powers, 1871-1945. Origins of the First and Second World Wars, the diplomacy of the wars, and the peace settlements which followed them. Two courses. *W. Scott*

255S-256S. Problems in African History. C-L: Comparative Area Studies. Two courses. *Staff*

260S. Economic History of Japan. C-L: Economics 232S. One course. *Bronfenbrenner*

261-262. Problems in Soviet History. Studies in the background of the Revolution of 1917 and the history and politics of the Soviet state. C-L: Comparative Area Studies. Two courses. *Lerner*

265S. Problems in Modern Latin American History. C-L: Comparative Area Studies. One course. *Bergquist*

267S-268S. From Medieval to Early Modern England. The intellectual, social, and political problems of transition to modern England, with special emphasis on the English Renaissance. C-L: Medieval and Renaissance Studies. Two courses. *Ferguson*

269S-270S. British History, Seventeenth Century to the Present. Historiography of social structure and social change: English Revolution, party, the Industrial Revolution, class and class consciousness, Victorianism, and the impact of war in the twentieth century. Two courses. *Cell*

273S, 274S. Topics in the History of Science. Critical stages in the evolution of scientific thought. Two courses. *Mauskopf*

277S. The Coming of the Civil War in the United States, 1820-1861. One course. *Durden*

278S. The Civil War in the United States and Its Aftermath, 1861-1900. One course. *Durden*

282S. Canada. C-L: Interdisciplinary Course 282S. One course. *Leach and visitors*

285S, 286S. Oral History. Research on race relations and civil rights in the United States in the twentieth century using techniques of oral history. Prerequisite: consent of instructor. Two courses. *Chafe and Goodwyn*

287S, 288S. History of Japan. The cultural, political, and social development of Japan in classical, medieval, and early modern eras; exploration of the political, economic, and ideological transformations that have brought Japan to prominence in this century. C-L: Comparative Area Studies. Two courses. *Huber*

297S. The British Empire of the Nineteenth Century. The development of the Empire from the American Revolution to the imperialism that culminated in the South Africa War. C-L: Canadian Studies and Comparative Area Studies. One course. *Cell*

298S. The Commonwealth in the Twentieth Century. The origins and evolution of the Commonwealth of Nations and its adjustment in the age of anticolonialism. C-L: Comparative Area Studies. One course. *Cell*

SMALL GROUP LEARNING EXPERIENCES

Independent Study

Independent study is usually undertaken by students concurrently with a course or with an instructor with whom they have had a course. Students should submit to the instructor in writing a detailed description of intent in the study. Both the instructor's consent and approval of the Director of Undergraduate Studies are required for enrollment.

191, 192. Independent Study. One or two courses each. *Staff*

Undergraduate Seminars

See also History 21S, 22S, 91S, 92S, 123S, 124S, 150S, 153S, 159S, 183S.

165S-166S. Seminars in Selected Topics. Course content determined by instructor. Prerequisite: consent of instructor. Two courses. *Staff*

195S-196S. Seminars for Undergraduates. Opportunities for historical investigation of significant problems. Juniors as well as seniors may apply for

admission to these courses and are urged to do so if they expect to be candidates for graduation with distinction in history or if they expect to practice-teach in their senior year. Open to majors and nonmajors. The sections are listed below. Two courses.

1. Renaissance Intellectual History, 1300 to 1600. *Witt*
2. Twentieth-Century Europe. *Colton*
3. Problems in the Social and Intellectual History of the United States. *Holley*
4. Medicine and Society in America. *English*
5. The Age of the American Revolution. *Wood*
6. The Era of the American Civil War, 1820-1900. *Durden*
7. Socialism and Revolution in East Asia. C-L: Comparative Area Studies. *Dirlik*
8. From Rural to Urban Society in the United States. *A. Scott*
9. German History, 1815-1918. *Staff*
10. International Socialism to the First World War. C-L: Comparative Area Studies. *Miller*
11. Problems in Modern British History. *Cell*
12. Europe and the World since 1914. *W. Scott*
13. Elizabethan England. C-L: Medieval and Renaissance Studies. *Ferguson*
14. England in the Ages of the Puritan and American Revolutions. *Staff*
15. The Emergence of Industrial Society in Western Europe, 1780-1914. *Reddy*
16. Science and Society. *Mauskopf*
17. Processes of Development in Traditional and Modern Japan. C-L: Comparative Area Studies. *Huber*
18. Problems in the History of Russia before 1917. C-L: Comparative Area Studies. *Lerner or Miller*
19. Social Conflict and Political Change in the United States, 1789-1860. *Nathans*
20. Comparative Problems in Early Modern European History. *Neuschel or Robisheaux*
21. Problems in Indian History. C-L: Comparative Area Studies. *Richards*
22. Problems in Latin American History. C-L: Comparative Area Studies. *Bergquist or TePaske*
23. Issues in the History of Tropical Africa. C-L: Comparative Area Studies. *Staff*
24. Problems in Recent United States Diplomatic History. *Davis*
25. Problems in Twentieth-Century American History. *Staff*
26. Popular Protest in British Society, 1750-1914. *Epstein*
27. Origins of the Cold War. *Kuniholm*

197S-198S. Senior Honors Seminar. Designed to introduce qualified students to advanced methods of historical research and writing and to the appraisal of critical historical issues. Open only to seniors, but not restricted to candidates for graduation with distinction. This course, when taken by a history major, is accompanied by either a year-long 195S-196S seminar or two courses at the 200 level. In unusual circumstances, with consent of the instructor, coordinator of the senior honors seminar, and Director of Undergraduate Studies, 191-192 may replace the two courses of 195S-196S seminars or the two courses at the 200 level. Two courses. *Staff*

Upperclassmen-Graduate Seminars

See History 201S, 202S, 205S, 206S, 207S, 208S, 209S, 210S, 218S, 219S, 220S, 224S, 226S, 231S, 232S, 234S, 237S, 238S, 253S, 254S, 255S-256S, 260S, 265S, 267S-268S, 269S-270S, 273S, 274S, 277S, 278S, 282S, 285S, 286S, 287S, 288S, 297S, and 298S.

COURSES CURRENTLY UNSCHEDULED

- 101C. Representative Europeans
- 101K. Topics in Premodern Chinese History
- 139S. Europe in the Age of National Unification
- 140S. Europe in the Age of German Ascendancy
- 202S. Russian Anarchism: Theory and Practice
- 204. The Uses of History in Public Policy II
- 207S, 208S. The Development of Urban America

HISTORY COURSES BY FIELDS

History courses for undergraduates are offered in five fields, as noted below; students majoring in the department must complete at least one course in each of three fields.

Africa, Asia, Canada, Caribbean, Latin America, Russia. History 26, 90, 175, 176, 101G, 102G, 109, 110, 115, 116, 128, 131, 132, 141, 142, 143, 144, 155, 159S, 161, 162, 167S, 174, 183S, 184, 193, 194; 195S-196S sections 7, 17, 18, 21, 22, 23; 201S, 202S, 231S, 232S, 234S, 239, 247, 248, 255S-256S, 260, 261-262, 265S, 282S, 287-288, 297S, 298S.

Ancient, Medieval and Renaissance. History 25, 53, 54, 100, 103, 104, 105, 107, 125, 126, 133, 134, 152, 173; 195S-196S sections 1, 13; 221, 222, 237S, 238S, 267S-268S.

Medicine, Military, Science, Technology. History 101H, 123S, 127S, 147, 148, 149, 151, 157, 158, 181, 182; 195S-196S sections 4, 16; 213, 219S, 220S, 273, 274.

Modern Europe. History 21, 21S, 22, 22S, 49S, 101C, 106, 108, 117, 118, 119, 120, 135, 136, 137, 138, 139, 140, 171, 179, 180; 195S-196S sections 2, 9, 10, 11, 12, 14, 20, 26; 218S, 253S, 254S, 269-270, 297S, 298S.

United States. History 91, 91S, 92S, 111, 112, 113, 114S, 121, 122, 129, 130, 145, 146, 150S, 153S, 160, 169, 170, 178; 195S-196S sections 3, 5, 6, 8, 19, 24, 25, 27; 205S, 206S, 207S, 208S, 209S, 210S, 212, 215-216, 227-228, 235, 236, 249-250, 277S, 278S, 285S, 286S.

THE MAJOR

Prerequisites. A sequence of two prerequisite courses in history (21-22, 21S-22S, 25-26, 53-54, 91-92, 91S-92S, 175-176).

Major Requirements. Eight courses in history including (1) at least two prerequisite courses, (2) at least one course in each of three out of the five fields described above, (3) two courses in an undergraduate seminar (195S-196S) or on the 200 level. Students are urged to register for two consecutive courses at this level, but may take two single semester courses with consent of both instructors. Students wishing to take advanced courses in a field are advised to elect the prerequisite course in that field.

Foreign Languages. Majors interested in a particular area of study benefit from knowledge of the language of that area. Majors who contemplate graduate work are reminded of the requirement of a reading knowledge of one or two foreign languages.

Majors Planning to Teach. Majors who plan to teach in secondary schools should consult an adviser in education. Rising juniors who intend to practice-teach in the senior year should take the 195S-196S or 197S-198S seminars or 200-level courses as juniors. History 212 is scheduled in the spring in accelerated sessions to accommodate students who are on campus for half of the semester during the semester they do practice teaching.

Honors. Any student who is qualified (see the section on honors in this bulletin) may apply to the Director of Undergraduate Studies for permission to undertake work leading to a degree with distinction in history.

House Courses (HC)

See the chapter "Academic Procedures and Information" for information on house courses.

Interdisciplinary Courses (IDC)

99. Perspectives in Archaeology. Major trends and issues in Old and New World archaeology: literature and material culture, history and process, and applications of archaeology to modern society. Weekly lectures by staff and

invited guests, followed by discussions, will focus on the material remains of past and contemporary cultures and the traditional and modern methods of their analysis. C-L: Anthropology 99, Classical Studies 99, and Religion 99. One course. *Meyers, Younger, and Zagarell*

101, 102. Introduction to the Civilizations of Southern Asia. Hindu, Islamic, and Buddhist foundations; impact of the West; and emergence of the modern nation-states of southern Asia. 101: traditional Hindu civilization and Islamic impact on southern Asia. 102: Western influences and the development of modern societies and states in southern Asia. C-L: Anthropology 101, 102; Comparative Area Studies; Education 101, 102; History 193, 194; and Religion 160, 161. Two courses. *Lawrence and staff*

103. An Introduction to Women's Studies. A survey of perspectives from numerous disciplines, e.g., literature, religion, history, on the experience of women and the importance of gender roles. One course. *Chafe and staff*

104. Public Policy and the Marine Environment. Economic, legal, medical, political, social, and scientific effects of human society on the marine environment. Special emphasis on coastal North Carolina. Lectures and projects. One course. *Costlow and staff*

107S-108S. Science, Technology, and Human Values. Open to seniors in the Science, Technology, and Human Values Program and to other seniors if space is available. Prerequisite: consent of instructor. Two half courses. *Staff*

109. Contemporary International Problems: Their Historical Origins and Their Implications for Future Policy. C-L: History 109, Political Science 160, Religion 156, and Sociology 175. One course. *Staff*

120. Perspectives on Food and Hunger. Issues of world food and hunger from an interdisciplinary perspective. Lectures present analytic approaches from the natural sciences, social sciences, and the humanities. C-L: Comparative Area Studies. Half course. *Johns and staff*

120A. Perspectives on Food and Hunger. See Interdisciplinary Course 120. Lectures, discussion meetings, and individual projects. C-L: Comparative Area Studies. One course. *Johns and staff*

150S. Comparative Area Studies Senior Seminar. Open to seniors majoring in Comparative Area Studies and to other seniors if space is available. Prerequisite: consent of instructor. One course. *Staff*

153S. The Insurgent South. Prerequisite: consent of instructor. C-L: History 153S. One course. *Goodwyn*

162, 163. Introduction to Islamic Civilization. Extensive survey of Muslim peoples and institutions. 162: the Middle Eastern origins and cultural attainments of medieval Islam. 163: modern developments and global features of the Islamic world. C-L: Anthropology 147, 148; Comparative Area Studies; History 101G, 102G; and Religion 162, 163. Two courses. *Richards*

170. Romanticism in the Arts. The literary, visual, and musical arts of the nineteenth century examined in their historical and theoretical context. Manifestations in the works of Goethe, Wordsworth, Balzac; Friedrich, Delecroix, Turner; Beethoven, Schumann, Berlioz; and others. Developments and continuities in sensibility and style. Guest lecturers, coordinated performances. Counts toward the distributional requirements in humanities. One course. *Applewhite or Orr*

180. Perspectives on Human Development. Themes and issues in anthropological, psychological, and sociological research on the life cycle. Maturation,

socialization, personality, and life-course transitions from childhood through later life. Introductory work in anthropology, psychology, or sociology is recommended. C-L: Psychology 130 and Sociology 169. One course. *Martin Lakin and Maddox*

181S. Art and Its Making. An inquiry into artistic process from a conceptual survey of dominant views to direct interviewing of and discussion with artists. Prerequisites: junior or senior standing and consent of instructor. C-L: Psychology 181S. One course. *Kremen*

184. An Introduction to Canada and Canadian Issues. A survey of the main geographic, historical, economic, governmental, and political facets that have shaped modern Canada and an examination of persistent and current issues facing the Canadian nation. C-L: Canadian Studies, Economics 184, History 184, Political Science 184, and Sociology 184. One course. *Leach*

234S. Political Economy of Development: Theories of Change in the Third World. See Political Science 234S. C-L: Anthropology 234S, Comparative Area Studies, History 234S, and Sociology 234S. One course. *Bergquist, Gereffi, Smith, and Valenzuela*

282S. Canada. Topics vary each semester and may include nationalism in Canada, Canadian defense policies, Canadian-American relations, regionalism in Canada, or others. C-L: Anthropology 282S, Canadian Studies, Economics 282S, History 282S, Political Science 282S, and Sociology 282S. One course. *Leach*

Italian

For courses in Italian, see Romance Languages.

Japanese

For courses in Japanese, see Asian and African Languages.

Judaic Studies—Cooperative Program at Duke and UNC-Chapel Hill

Professor E. Meyers (religion), *Director*; Professor Wintermute (religion); Associate Professors Alt (Germanic languages and literature), Bailey (Divinity School), Bland (religion), Halperin (religion), and C. Meyers (religion)

A program in Judaic studies may be taken as part of a major in religion or as a supplement to any other major. It may also be taken under Program II.

For descriptions of the courses consult the listings under the specified departments.

German

- 171. Yiddish Literature in Translation. *Alt*
- 181, 182. Elementary Yiddish. *Alt*

Religion

- 50. The Old Testament. *Jones, C. Meyers, E. Meyers, and Wintermute*
- 51. Introduction to Judaic Civilization. *Bland or E. Meyers*
- 104. The Prophets of the Old Testament. *Wintermute*
- 105. Theology of the Old Testament. *Wintermute*
- 109. Women in the Biblical Tradition: Image and Role. *C. Meyers*
- 110. Archaeology and Art of the Biblical World. *C. Meyers or E. Meyers*
- 115-116. Introduction to Biblical Hebrew. *Bailey*
- 131D. Principles of Archaeological Investigation. *C. Meyers or E. Meyers*

- 132D. Palestine in Late Antiquity. *E. Meyers*
- 133. Foundations of Postbiblical Judaism. *E. Meyers*
- 134. Jewish Mysticism. *Bland*
- 135. Jewish Religious Thought. *Bland*
- 136. Contemporary Jewish Thought. *Bland or E. Meyers*
- 139. Modern Hebrew. *Staff*
- 195B, 196B. Junior-Senior Seminars. *Staff*
- 207, 208. Intermediate Biblical Hebrew. *E. Meyers and Wintermute*
- 220. Rabbinic Hebrew. *E. Meyers or staff*
- 221. Readings in Hebrew Biblical Commentaries. *Bland*
- 238. Jewish Responses to Christianity. *Bland*
- 244. The Archaeology of Palestine in Hellenistic-Roman Times. *E. Meyers*

Opportunities for independent study are offered in the Department of Religion under 191, 192, 193, 194. Procedures for registration and applications are available in 117 Gray Building.

Special attention is directed to those courses in New Testament which are relevant to the study of Rabbinic Judaism, i.e., Religion 106, 107, 108, and 111. A list of appropriate courses at the University of North Carolina at Chapel Hill is available in 230C Gray Building, Duke University, and in 101 Saunders Hall, University of North Carolina, Chapel Hill.

Latin

For courses in Latin, see Classical Studies.

Linguistics

Students interested in the study of language as part of their undergraduate program or as preparation for graduate work in linguistics should consult the instructors of the courses listed below, or for information, consult Professor Butters in the Department of English. No major is offered in linguistics, except through Program II. For descriptions of the following courses see the listings of the specified departments:

Anthropology

- 107. Introduction to Linguistics. *Apte, Butters, or Hull*
- 116. Language, Ethnicity, and New Nations. *Apte*
- 117. Language, Law, and Politics. *O'Barr*
- 118. The Language of Advertising. *O'Barr*
- 119. Language, Culture, and Society. *Apte or Weller*
- 211S. Ethnography of Communication. *Apte, O'Barr, or Weller*

English

- 111. Introduction to Linguistics. *Staff*
- 112. English Historical Linguistics. *Butters or Nygard*
- 115. Present-Day English. *Butters or Nygard*
- 119S. Special Topics in Language. *Butters or Nygard*
- 207. Old English Language and Literature. *Nygard*
- 208. History of the English Language. *Butters or Nygard*
- 209. Present-Day English. *Butters or Nygard*

French

- 131S. French in the New World. *Hull*
- 210. The Structure of French. *Hull*
- 211. History of the French Language. *Hull*

German

- 205, 206. Middle High German. *Rosenberg*
- 216. History of the German Language. *Rosenberg*
- 219. Applied Linguistics. *Rosenberg*

Philosophy

- 103. Symbolic Logic. *Brandon or Posy*
- 109. Philosophy of Language. *Posy*

Psychology

134. Psychology of Language. *Day*

271E. Psychology of Language. *Day*

Spanish

210. History of the Spanish Language. *Garcí-Gómez*

Management Sciences (MS)

Professor Keller, *Chairman*; Professor Dickens, *Director of Undergraduate Studies*

The courses listed below are offered for undergraduates by the Fuqua School of Business. They are professional school courses and hence do not count for the distributional requirements. They fall within the limit of six professional school courses which may count for an undergraduate degree from Trinity College. A major is not offered to undergraduate students.

Taking a selection of these courses may be helpful in preparation for graduate education in business and law and may provide the liberal arts, science, and engineering student an advantage in placement. Students planning to take the accounting concentration in the Master of Business Administration Program of the Fuqua School of Business either following graduation or in the undergraduate-professional combination program should take Management Sciences 53 and 137 at a minimum.

The Director of Undergraduate Studies is available for consultation with undergraduates.

53. Introductory Financial Accounting. The accounting model of the firm and transactions analysis. Topics include the procedures used to process accounting data, issues in asset valuation and income determination, and financial statement analyses. Prerequisite: sophomore standing. One course. *Staff*

114. Decision Models. Development and use of models in the analysis of decision problems. Topics include linear programming and decision analysis; approaches to the solution of complex problems. Prerequisite: Mathematics 31. One course. *Staff*

120. Analysis of Organizational Behavior. Organizations and the behavior of individuals within organizations with emphasis on environmental, structural, and human factors. Topics include socialization, work motivation, decision making, leadership, power, control, small group behavior, strategy formation, organization design, organizational culture, and effects of technology. Prerequisite: junior standing. One course. *Staff*

137. Managerial Accounting. The use of accounting information by management in short-term planning, control, and decision making in business enterprises. Cost accumulation, cost analysis, cost estimation, the development of standards, introduction to budgeting, and short-run decisions. Prerequisite: Management Sciences 53. One course. *Staff*

151. Investment Management. Problems of selecting a portfolio of investments emphasizing the economics of the markets and the tools of analysis. Prerequisites: Economics 138 or equivalent and junior standing. One course. *Staff*

154. Finance. Problems of financial management of the firm. Cash management, receivables management, short-term financial planning, cost of capital, capital budgeting, dividend policy, lease analysis, and long-term financial planning. Prerequisite: junior standing. One course. *Staff*

161. Marketing Management. The role of the marketing function in business; product planning, price, promotion, and distribution as elements of a total

marketing mix. Formal models in solving the marketing mix problem of the firm. Prerequisite: junior standing. One course. *Staff*

171. Production and Operations Management. Issues in the design, operation, and control of the process by which goods are manufactured and services delivered. Topics include work-force management, production planning and materials management, capacity and technology choice, and the combination of operations choices into a coherent strategy. Prerequisite: junior standing. One course. *Staff*

199. Special Topics. Prerequisites: junior or senior standing and consent of instructor. One course. *Staff*

Marine Sciences—The University Program

Professor Costlow (zoology), *Director*; Associate Professor Ramus (botany), *Assistant Director for Academic Programs*; Associate Professor Forward (zoology), *Director of Undergraduate Student Affairs*; Professors Barber (botany and zoology), Gutknecht (physiology), Pilkey* (geology), and White* (botany); Associate Professors McClay* (zoology), Rosendahl* (geology), Searles* (botany), Sullivan (biochemistry), and Sutherland (zoology); Assistant Medical Research Professors C. Bonaventura (biochemistry) and J. Bonaventura (biochemistry); Associate Research Professors Kirby-Smith (Marine Laboratory) and McKaye (Marine Laboratory); Assistant Research Professor Louda (Marine Laboratory); Professor Emeritus Bookhout (zoology)

The interdisciplinary program in marine sciences provides juniors and seniors with a unique opportunity to live and study at the Duke University Marine Laboratory for a full academic term—fall, spring, or summer. The program emphasizes small class size, independent study, and integrated classroom, laboratory, and field experience. Students have daily access to modern scientific equipment, a specialized library, and the surrounding natural marine environment. Participation in both the spring and fall terms is possible for all majors with appropriate preparation.

In the fall and spring terms students may choose from two curricular options. Fall term, option 1: Botany/Zoology 167, either Zoology 169L or Biochemistry 245L, two of three half-course seminars, and independent study. Fall term, option 2: as option 1, except the student does not enroll in independent study, but enrolls in both Zoology 169L and Biochemistry 245L. Spring term, option 1: Interdisciplinary Course 104, either Zoology 150L or Botany 115L, two of three half-course seminars, and independent study. Spring term, option 2: as option 1, except the student does not enroll in independent study, but enrolls in both Zoology 150L and Botany 115L. Students are encouraged to choose the first option during either term.

Duke University students wishing to apply to the fall term or the spring term must (1) obtain the written approval of their faculty adviser, and (2) submit the completed application and a current transcript of academic work by the fourth Friday in March (for the fall term) or the second Friday in November (for the spring term) to the Admissions Office, Duke University Marine Laboratory, Beaufort, North Carolina 28516. Students will be notified of the action of the Admissions Committee shortly after each deadline.

The summer curriculum, taught in three five-week terms, includes a rich assortment of courses in the natural sciences. In addition, attention is directed to the new courses Marine Biology (Biology 10L), an introductory course designed to

*Summer only.

fulfill the empirical natural science requirement for humanities or social sciences majors, and the Economics of Fisheries (Economics 60) which counts towards the social sciences division requirement.

Applications for summer courses must be accompanied by a current academic transcript and should be submitted by the end of April (applications will be considered on a space-available basis thereafter). Duke students must obtain the written approval of their faculty adviser. Application must be made to the address indicated above.

The following courses are described in the listings of the specified departments and in the *Bulletin of Duke University: Marine Laboratory*.

SUMMER COURSES AT BEAUFORT

Marine Biology. (Biology 10L.) One course. *Kirby-Smith*

Economics of Fisheries. (Economics 60.) One course. *Winter (visiting summer faculty)*

Introduction to Biological Oceanography. (Zoology 114L.) One and one-half courses. *Cahoon (visiting summer faculty)*

Diversity of Plants. (Botany 144L/244L.) One and one-half courses. *White*

Plant Ecology. (Botany 147L/247L.) One and one-half courses. *Staff*

Physiology of Marine Animals. (Zoology 150L/250L.) One course. *Forward*

Marine Invertebrate Zoology. (Zoology 176L.) One and one-half courses. *Bookhout*

Independent Study. (Botany 191, 192 or Zoology 191, 192.) Credits to be arranged. *Staff*

Marine Ecology. (Zoology 203L.) One and one-half courses. *Hay (visiting summer faculty)*

Primary Productivity in the Seas. (Botany 215L or Zoology 215L.) One course. *Barber and Ramus*

Barrier Island Ecology. (Botany 218.) One and one-half courses. *Staff*

Benthic Marine Algae. (Botany 219L.) One course. *Searles*

Tropical Seaweeds. (Botany 263L.) Half course. *Searles*

Marine Invertebrate Zoology. (Zoology 274L.) One and one-half courses. *Ryland (visiting summer faculty)*

Comparative and Evolutionary Biochemistry. (Biochemistry 276L.) One and one-half courses. *Sullivan*

Invertebrate Developmental Biology. (Zoology 278L.) One and one-half courses. *McClay and visiting staff*

FALL COURSES AT BEAUFORT

Analysis of Marine Ecosystems. (Botany 167 or Zoology 167.) Prerequisites: introductory biology and chemistry. One course. *Barber*

Ecological Oceanography. (Zoology 169L.) Students may not receive credit for both Zoology 103L and 169L. Prerequisites: introductory biology and Mathematics 31. One course. *Sutherland*

Independent Study. (Botany 191, Zoology 191, Biochemistry 209, or as listed under the student's major department.) For junior and senior majors with consent

of Director of Undergraduate Studies and supervising instructor. One course.
Staff

Light in the Sea. (Botany 195S.) Half course. *Ramus*

Membrane Physiology. (Physiology 219S.) Half course. *Gutknecht*

Macromolecules, Ecology, and Evolution. (Biochemistry 245L.) The structure and function of protein and nucleic acid molecules with particular emphasis on the application of molecular techniques to questions in ecological, systematic, and evolutionary theory. One course. *Sullivan*

Marine Animal Navigation. (Zoology 295S.) Half course. *Forward*

SPRING COURSES AT BEAUFORT

Public Policy and the Marine Environment. (Interdisciplinary Course 104.) Economic, legal, medical, political, social, and scientific effects of society on the marine environment. Special emphasis on coastal North Carolina. Lectures and projects. One course. *Costlow and staff*

Phytoplankton. (Botany 115L.) Prerequisite: introductory biology. One course. *Ramus*

Physiology of Marine Animals. (Zoology 150L.) Students may not receive credit for both Zoology 150L and 250L. Prerequisites: introductory biology and Chemistry 12. One course. *Forward*

Independent Study. (Botany 192, Zoology 192, Biochemistry 210, or as listed under the student's major department.) For juniors and seniors with consent of Director of Undergraduate Studies and supervising instructor. One course.
Staff

Beach and Island Geological Processes. (Geology 196S.) Half course.
Staff

Adaptations of Organisms to the Marine Environment. (Biochemistry 220S.) Half course. *Bonaventura*

Human Impact on Biogeochemical Cycles. (Botany 296S or Zoology 296S.) Half course. *Barber*

Natural History of Coastal Marine Systems. (Botany 296S or Zoology 296S.) Half course. *Costlow and Kirby-Smith*

Marine Fishes: Selected Topics. (Zoology 296S.) Half course. *Forward and Sullivan*

Experimental Ecology of the Marine Intertidal Zone. (Zoology 296S.) Half course. *Sutherland*

COURSES CURRENTLY UNSCHEDULED

Marine Microbiology. (Botany 204.)

Geological Oceanography. (Geology 205.)

Adaptations of Organisms to the Marine Environment. (Biochemistry 220L.)

Introduction to Marine Geophysics. (Geology 250.)

Marine Biochemistry and Genetics. (Biochemistry 266S.)

Ecological Basis for Coastal Area Planning and Management. (Forestry and Environmental Studies 293.)

Mathematics (MTH)

Professor Reed, *Chairman*; Associate Professor Smith, *Director of Undergraduate Studies*; Associate Professor Kraines, *Supervisor of Freshman Instruction*; Professors Allard, DiPerna, Schaeffer, Shoenfield, Warner, and Weisfeld; Associate Professors Burdick, R. Hodel, Kitchen, Moore, Pardon, Schonbek, and Scoville; Assistant Professors Flath, Lawler, Schoen, Shearer, Sylvester, Wolpert, and Wright; Adjunct Professors Bernstein and Chandra; Visiting Associate Professor Lane; Visiting Assistant Professor Illner; Instructors Blake, Bookman, and Hammond; Part-time Instructors M. Hodel and Katz

9-10. Preparatory and Precalculus Mathematics. A two-semester skills course for students who need to review topics in high school mathematics while covering the material in Mathematics 19. Students whose Mathematics SAT scores are 500 or below, or whose CEB Mathematics Level I or II Achievement Test scores are 480 or below, need this two-semester course before taking Mathematics 31. No credit for Mathematics 9 without successful completion of Mathematics 10. Not open to students who take Mathematics 19. Prerequisite for 10: Mathematics 9. One course. *Staff*

19. Precalculus Mathematics. Selected topics in algebra, trigonometry, and analytic geometry. Students with achievement scores in mathematics below 550 need this skills course before taking Mathematics 31. Not open to students who take Mathematics 10. Prerequisite: two units of college preparatory mathematics. One course. *Staff*

31. Introductory Calculus I. Functions, limits, continuity, trigonometric functions, techniques and applications of differentiation, indefinite and definite integrals, the fundamental theorem. One course. *Staff*

32. Introductory Calculus II. Transcendental functions, techniques and applications of integration, indeterminate forms, improper integrals, infinite series. Not open to students who have had Mathematics 36. Prerequisite: Mathematics 31 or 33. One course. *Staff*

31P, 32P. Preceptorial. Elective preceptorial for students enrolled in Mathematics 31 and 32. *Staff*

31X, 32X. Introductory Honors Calculus I and II. Similar to Mathematics 31 and 32, but faster paced and more challenging. Open to students who score at least 750 on the SAT Mathematics Aptitude Test. Two courses. *Staff*

33, 34. Introductory Calculus with Digital Computation. Same as 31, 32 but these courses meet one additional hour per week to discuss the solution of calculus problems using the computer. No programming experience required. Prerequisites for 34: Mathematics 33 or 31 and consent of instructor. Two courses. *Staff*

36. Calculus for the Social Sciences. Applications of exponential and logarithmic functions, differential equation models, techniques and applications of integration, partial differentiation with applications, geometric and exponential series. Not open to students who have had Mathematics 32 or 34. Does not fulfill the prerequisite for Mathematics 103. Prerequisite: Mathematics 31 or 33. One course. *Staff*

53. Basic Statistics. Statistical concepts involved in making inferences, decisions, and predictions from data. Techniques not emphasized. Not open to students who have had Economics 138 or Psychology 117. One course. *Staff*

103. Intermediate Calculus. Partial differentiation, multiple integrals, topics in differential and integral vector calculus. Prerequisite: Mathematics 32 or 34. One course. *Staff*

104. Linear Algebra and Applications. Systems of linear equations and elementary row operations, Euclidean n -space and subspaces, linear transformations and matrix representations, Gram-Schmidt orthogonalization process, determinants, eigenvectors and eigenvalues; applications. Prerequisite: Mathematics 32 or 34. One course. *Staff*

103X, 104X. Intermediate Honors Calculus. Similar to Mathematics 103, 104, but more theoretical. Students who have taken 31X, 32X are encouraged to enroll. Students continuing from 103X should take 104X rather than 104. Two courses. *Staff*

105. Intermediate Calculus with Digital Computation. Same as 103, but this course meets one additional hour per week to discuss the solution of calculus problems using the computer. The course is a continuation of Mathematics 33, 34. Prerequisites: Mathematics 34 or 32 and the equivalent of Computer Science 51. One course. *Staff*

106. Linear Algebra with Digital Computation. Same as 104, but with additional applications of eigenvalues and eigenvectors. Packaged computer programs will be used extensively. No programming experience required. Prerequisite: Mathematics 103 or 105. One course. *Staff*

111. Applied Mathematical Analysis I. First and second order differential equations with applications; matrices, eigenvalues, and eigenvectors; linear systems of differential equations; Fourier series and applications to partial differential equations. Intended primarily for engineering and science students with emphasis on problem solving. Not open to students who have had Mathematics 131. Prerequisite: Mathematics 103. One course. *Staff*

114. Applied Mathematical Analysis II. Boundary value problems, complex variables, Cauchy's theorem, residues, Fourier transform, applications to partial differential equations. Not open to students who have had Mathematics 230. Prerequisites: Mathematics 111 or 131 or 103 and consent of instructor. One course. *Staff*

117. Introduction to Statistical Methods. Emphasis on the classical techniques of hypothesis testing and point and interval estimation, using the binomial normal, t , F , and chi square distributions. Not open to students who have had Mathematics 136. Prerequisite: Mathematics 103 (may be taken concurrently) or consent of instructor. One course. *Staff*

126. Introduction to Linear Programming and Game Theory. Fundamental properties of linear programs; linear inequalities and convex sets; primal simplex method, duality; integer programming; two-person and matrix games. Prerequisites: Mathematics 32 or 34 and 103 and 104 or consent of instructor. One course. *Staff*

128. Number Theory. Divisibility properties of integers, prime numbers, congruences, quadratic reciprocity, number-theoretic functions, simple continued fractions, rational approximations. Prerequisite: Mathematics 32 or 34 or consent of instructor. One course. *Staff*

131. Elementary Differential Equations. Solution of differential equations of elementary types; formation and integration of equations arising in applications. Not open to students who have had Mathematics 111. Prerequisite: Mathematics 103; corequisite: Mathematics 104. One course. *Staff*

132S. Qualitative Theory of Ordinary Differential Equations. Qualitative behavior of general systems of ordinary differential equations, with application to biological and ecological systems, oscillations in biochemistry, electrical networks,

and the theory of deterministic epidemics. Prerequisite: Mathematics 131 or 111 or consent of instructor. One course. *Staff*

135. Probability. Probability models, random variables with discrete and continuous distributions. Independence, joint distributions, conditional distributions. Expectations, functions of random variables, central limit theorem. Prerequisite: Mathematics 103. One course. *Staff*

136. Statistics. Sampling distributions, point and interval estimation, maximum likelihood estimators. Tests of hypotheses, the Neyman-Pearson theorem. Bayesian methods. Not open to students who have had Mathematics 117. Prerequisites: Mathematics 104 and 135. One course. *Staff*

139, 140. Advanced Calculus. The real number system, rigorous development of one-variable calculus, series and uniform convergence. Topics in multivariable calculus such as multiple integrals, differentiation of transformations, implicit function theorems, differential forms. Not open to students who have had Mathematics 203, 204. Prerequisite for 139: Mathematics 103; for 140: Mathematics 104 and 139. Two courses. *Staff*

171S. Elementary Topology. Introduction to graph theory, including the Königsberg bridge problem and four color problem; metric spaces and topological spaces; basic topological properties including compactness and connectedness; Brouwer fixed point theorem for $n=2$, classification of compact, connected, 2-manifolds. Prerequisites: Mathematics 103 and 104. One course. *Staff*

187. Introduction to Mathematical Logic. Propositional calculus; predicate calculus. Gödel completeness theorem, applications to formal number theory, incompleteness theorem, additional topics in proof theory or computability. Prerequisites: Mathematics 103 and 104 or Philosophy 103. One course. *Staff*

191, 192. Independent Study. Directed reading and research. Admission by consent of instructor and Director of Undergraduate Studies. Two courses. *Staff*

193, 194. Independent Study. Same as 191, 192, but for seniors. Two courses. *Staff*

196S. Seminar in Mathematical Model Building. Real models, mathematical models, axiom systems as used in model building, deterministic and stochastic models, linear optimization, competition, graphs and networks, growth processes, evaluation of models. Term project: model of a nonmathematical problem. Prerequisites: Mathematics 103 and 104. One course. *Smith*

197S. Seminar in Mathematics. Intended primarily for juniors and seniors majoring in mathematics. Content of course determined by instructor. Prerequisites: Mathematics 103 and 104. One course. *Staff*

For Seniors and Graduates

200. Introduction to Algebraic Structures I. Laws of composition, groups, rings; isomorphism theorems; axiomatic treatment of natural numbers; polynomial rings; division and Euclidean algorithms. Prerequisite: Mathematics 104 or equivalent. One course. *Staff*

201. Introduction to Algebraic Structures II. Vector spaces, matrices and linear transformations, fields, extensions of fields, construction of real numbers. Prerequisite: Mathematics 200 or equivalent. One course. *Staff*

203. Basic Analysis I. Topology of R^n , continuous functions, uniform convergence, compactness, infinite series, theory of differentiation, and integration. Not open to students who have had Mathematics 139. Prerequisite: Mathematics 104. One course. *Staff*

204. Basic Analysis II. Inverse and implicit function theorems, differential forms, integrals on surfaces, Stokes' theorem. Not open to students who have had Mathematics 140. Prerequisite: Mathematics 203. One course. *Staff*

205. Topology. Elementary topology, surfaces, covering spaces, Euler characteristic, fundamental group, homology theory, exact sequences. One course. *Staff*

206. Differential Geometry. Geometry of curves and surfaces, the Serret-Frenet frame of a space curve, the Gauss curvature, Cadazzi-Mainardi equations, the Gauss-Bonnet formula. Prerequisite: Mathematics 104. One course. *Staff*

221, 222. Numerical Analysis I, II. C-L: Computer Science 221, 222. Two courses. *Gallie, Patrick, or Utku*

230. Mathematical Methods in Physics and Engineering I. Heat and wave equations, initial and boundary value problems, Fourier series, Fourier transforms, potential theory. Not open to students who have had Mathematics 114. Prerequisites: Mathematics 103 and 104 or equivalents. One course. *Staff*

231. Mathematical Methods in Physics and Engineering II. Green's functions, propagators, integral equations, spectral theory on Hilbert space, Fredholm alternative, variational methods. Prerequisite: Mathematics 114 or 230. One course. *Staff*

234. Mathematics for Quantum Mechanics. Hilbert space, self-adjoint operators, the mathematical model of quantum mechanics, commutation relations, spectral analysis of Hamiltonians, time dependent scattering theory. Prerequisites: Mathematics 230 and 231 or equivalents. One course. *Staff*

235. Topics in Mathematical Physics. Group representations, perturbation theory, quantum field theory, statistical mechanics, or general relativity. Prerequisite: Mathematics 231 or equivalent. One course. *Staff*

238, 239. Topics in Applied Mathematics. Conceptual basis of applied mathematics, combinatorics, graph theory, game theory, mathematical programming, or numerical solution of ordinary and partial differential equations. Prerequisites: Mathematics 103 and 104 or equivalents. Two courses. *Staff*

240. Applied Stochastic Processes. Applications of probability theory and stochastic processes to economics and environmental science. Markoff chains, optional stopping, queuing theory, decision theory, birth and death processes, and the Monte-Carlo method. Prerequisite: Mathematics 135 or equivalent. One course. *Staff*

241. Linear Models. Geometric interpretation, multiple regression, analysis of variance, experimental design, analysis of covariance. Prerequisite: Mathematics 136 or equivalent. One course. *Staff*

242. Multivariate Statistics. Multinormal distributions, multivariate general linear model, Hotellings T^2 statistic, Roy union-intersection principle, principal components, canonical analysis, factor analysis. Prerequisite: Mathematics 241 or equivalent. One course. *Staff*

248, 249. Topics in Statistics. Analysis of variance, design of experiments, nonparametric statistics, foundations of statistical inference. Prerequisite: consent of instructor. Two courses. *Staff*

250. Introductory Mathematical Logic. First-order logic, completeness theorem, compactness theorem, introduction to recursive functions, incompleteness theorem. Prerequisite: Mathematics 187 or 200 or equivalent. One course. *Staff*

- 251. Set Theory I.** Zermelo-Fraenkel axioms, ordinals and cardinals, models of set theory, constructible sets. Prerequisite: Mathematics 187 or 200 or equivalent. One course. *Staff*
- 252. Set Theory II.** Forcing, large cardinals, determinateness, and other advanced topics. Prerequisite: Mathematics 251. One course. *Staff*
- 258, 259. Topics in Logic.** Model theory, recursion theory, set theory, or other fields of logic. Prerequisite: Mathematics 250 or equivalent. Two courses. *Staff*
- 260. Groups, Rings, Modules.** Elementary categorical algebra, groups, rings, modules, linear and multilinear algebra. Prerequisite: Mathematics 201 or equivalent. One course. *Staff*
- 261. Commutative Algebra.** Fields, Noetherian rings and modules. Dedekind domains. Prerequisite: Mathematics 260 or equivalent. One course. *Staff*
- 268, 269. Topics in Algebra.** Algebraic number theory, algebraic K-theory, homological algebra, or topological algebra. Prerequisite: Mathematics 260. Two courses. *Staff*
- 271. Algebraic Topology.** Fundamental group and covering spaces, homology groups of cell complexes, classification of compact surfaces, the cohomology ring and Poincaré duality for manifolds. Prerequisites: Mathematics 171S and 200 or equivalents. One course. *Staff*
- 278, 279. Topics in Topology.** Point set, algebraic, geometric, or differential topology. Prerequisite: consent of instructor. Two courses. *Staff*
- 280. Differential Analysis.** Differential calculus, ordinary differential equations, flows, Lie bracket, total differential equations, first order partial differential equations, deRham theory. Prerequisite: Mathematics 140 or equivalent. One course. *Staff*
- 281. Real Analysis I.** Measures; Lebesgue integral; L^p -spaces; Daniell integral, differentiation theory, product measures. Prerequisite: Mathematics 140 or equivalent. One course. *Staff*
- 282. Real Analysis II.** Metric spaces, fixed point theorems, Baire category theorem, Banach spaces, fundamental theorems of functional analysis, Fourier transform. Prerequisite: Mathematics 281 or equivalent. One course. *Staff*
- 283. Linear Operators.** Bounded and unbounded operators on Banach and Hilbert spaces, symmetric and self-adjoint operators, Banach algebras, spectral theorem, unitary groups, compact operators, Fredholm theory, accretive operators, semigroups of operators. Prerequisite: Mathematics 282 or equivalent. One course. *Staff*
- 284. Topics in Functional Analysis.** Advanced spectral analysis, operator algebras, nonlinear functional analysis, or structure theory of Banach spaces. Prerequisite: Mathematics 282 or equivalent. One course. *Staff*
- 285. Complex Analysis.** Complex calculus, conformal mapping, Riemann mapping theorem, Riemann surfaces. Prerequisite: Mathematics 140 or equivalent. One course. *Staff*
- 286. Topics in Complex Analysis.** Geometric function theory, function algebras, several complex variables, uniformization, or analytic number theory. Prerequisite: Mathematics 285 or equivalent. One course. *Staff*
- 288, 289. Topics in Analysis.** Harmonic analysis, dynamical systems, geometric measure theory, or calculus of variations. Prerequisites: Mathematics 281 and 285 or equivalents. Two courses. *Staff*

290. Probability. Random variables, independence, expectations, laws of large numbers, central limit theorem, Markoff chains. Prerequisite: Mathematics 281 or equivalent. One course. *Staff*

297. Fourier Analysis and Distribution Theory. Tempered distributions, Fourier transforms, classical inequalities, oscillatory integrals. Prerequisites: Mathematics 140 and 285 or equivalents. One course. *Staff*

298. Partial Differential Equations I. Fundamental solutions of linear partial differential equations, hyperbolic equations, characteristics; Cauchy-Kovalevskaya theorem; propagation of singularities. Prerequisite: Mathematics 297 or equivalent. One course. *Staff*

299. Partial Differential Equations II. Elliptic boundary value problems, regularity theorems, the diffusion equation, nonlinear equations. Prerequisite: Mathematics 298 or equivalent. One course. *Staff*

COURSES CURRENTLY UNSCHEDULED

103P. Preceptorial

104P. Preceptorial

123. Geometry

135P, 136P. Preceptorial

293, 294. Topics in Probability Theory

THE MAJOR

The Department of Mathematics publishes a handbook to guide majors in selecting courses for various areas of interest. A copy may be obtained from the Director of Undergraduate Studies.

For the A.B. Degree

Major Requirements. Six courses in mathematics numbered above 106, including one of the following year sequences: Mathematics 139, 140; 200, 201; 203, 204; or 205, 206.

For the B.S. Degree

Major Requirements. Eight courses in mathematics numbered above 106, including two of the sequences 135, 136; 139, 140; 200, 201; 203, 204; 205, 206; 230, 231 except that if both 135, 136 and 230, 231 are chosen then one other sequence from this list must also be taken. Students must also meet an area of concentration requirement by (1) satisfying the major requirement of any discipline other than mathematics or by (2) completing a program of four mathematically related courses approved by the Director of Undergraduate Studies.

Honors

The department offers a program for graduation with distinction in mathematics. See the section on honors in this bulletin and also the *Handbook for Majors*.

School of Medicine—Basic Science Courses Open to Undergraduates

Qualified students in arts and sciences may select courses from the following offered by the graduate departments associated with the School of Medicine. A major is not offered to undergraduates in any of the departments listed below. For

permission to register for these courses and for further information, see Professor Cartmill (anatomy), Associate Professors Padilla (physiology), Siegel (biochemistry), or Vanaman (microbiology). The following courses are described in the *Bulletin of Duke University: Graduate School*.

Anatomy (ANA)

- 151. Anatomy of the Lower Extremities as It Relates to Locomotion. Prerequisite: written consent of instructor. One course. *Bassett*
- 193, 194. Independent Study. Open to qualified juniors and seniors with written consent of instructor. Two courses. *Staff*
- 217. Structure and Function of Visual Photoreceptors. Prerequisite: consent of instructor. Credit to be arranged; maximum one course. *Corless and McCaslin*
- 219. Molecular and Cellular Bases of Differentiation. C-L: Physiology 230. One course. *Counce and staff*
- 219S. Seminar. Optional seminar offered in conjunction with Anatomy 219. Half course. *Counce*
- 220. Developmental Biology. Prerequisite: a course in genetics or cell biology. One course. *Counce and Marchase*
- 259. Molecular Biology I: Protein and Membrane Structure/Function. Prerequisite: introductory biochemistry or consent of instructor. C-L: Biochemistry 259 and Microbiology and Immunology 259. One course. *Vanaman and staff*
- 260S. Interactions of Differentiated Cells. C-L: Microbiology and Immunology 260S and Physiology 260S. Half course. *Conn, Jakoi, Padilla, and Vanaman*
- 269. Advanced Cell Biology. Prerequisite: introductory cell biology or consent of instructor. C-L: Botany 269, Microbiology and Immunology 269, and Zoology 269. One course. *Nicklas and staff*
- 270. Neurobiology I. Prerequisites: Biochemistry 227 and 228 or equivalents. C-L: Physiology 270. One course. *Moore and staff*
- 286. Electron Microscopy and Related Techniques. Prerequisites: calculus and one year each of physics and general chemistry and consent of instructor. One course. *Longley*

Biochemistry (BCH)

- 209, 210. Independent Study. One or two courses. *Staff*
- 215. Genetic Mechanisms. Prerequisite: introductory biochemistry. C-L: University Program in Genetics. One course. *Gross and staff*
- 220L. Adaptations of Organisms to the Marine Environment. Given at Beaufort. Prerequisites: introductory biology and organic chemistry and consent of instructor. One course. *C. Bonaventura or J. Bonaventura*
- 220S. Adaptations of Organisms to the Marine Environment. Half course. *C. Bonaventura or J. Bonaventura*
- 222. Structure of Biological Macromolecules. Half course. *Richardson*
- 227. Introductory Biochemistry I: Intermediary Metabolism. Prerequisite: organic chemistry. C-L: Botany 227. One course. *Friedovich and Rajagopalan*
- 228. Introductory Biochemistry II: Biological Macromolecules. Prerequisite: Biochemistry 227 or equivalent. C-L: Botany 228. One course. *Greenleaf and Webster*
- 245L. Macromolecules, Ecology, and Evolution. The structure and function of protein and nucleic acid molecules with particular emphasis on the application of molecular techniques to questions in ecological, systematic, and evolution theory. One course. *Sullivan*
- 259. Molecular Biology I: Protein and Membrane Structure/Function. Prerequisite: introductory biochemistry or consent of instructor. C-L: Anatomy 259 and Microbiology and Immunology 259. One course. *Staff*
- 265S, 266S. Seminar. Topics and instructors announced each semester. Half course or variable. *Staff*
- 268. Molecular Biology II: Nucleic Acids. Prerequisites: introductory biochemistry and Biochemistry 259 or consent of instructor. C-L: Botany 268 and Microbiology and Immunology 268. One course. *Modrich and staff*
- 276L. Comparative and Evolutionary Biochemistry. Given at Beaufort. One and one-half courses. *Sullivan*
- 291. Physical Biochemistry. Prerequisites: Chemistry 161 and 162 or equivalents. One course. *Richardson and staff*
- 297. Intermediary Metabolism. One course. *Siegel and staff*
- 299. Nutrition. Half course. *Kamin*

Microbiology and Immunology (MIC)

- 103L. General Microbiology. Prerequisite: one course in a biological science or consent of instructor. C-L: Botany 103L. One course. *Johnson and Wheat*

- 209, 210. Independent Study. A laboratory or library project. One or two courses by arrangement. *Staff*
221. Medical Microbiology. Prerequisite: consent of instructor. One course. *Joklik and staff*
- 221L. Medical Microbiology. Prerequisite: consent of instructor. One and one-half courses. *Joklik and staff*
234. Introduction to Biostatistical Methods. Prerequisite: elementary mathematics including college algebra. One course. *Amos and Dawson*
236. Statistical Methods in Human Genetics. Prerequisite: introductory genetics. One course. *Amos and Dawson*
238. Intermediate Biostatistics and Data Analysis. Prerequisite: Microbiology 234 or equivalent. One course. *Dawson*
244. Principles of Immunology. Prerequisites: Zoology 160 and Chemistry 151, 152 and consent of instructor. C-L: Zoology 244. One course. *McClay and Whisnant*
259. Molecular Biology I: Protein and Membrane Structure/Function. Prerequisite: introductory biochemistry or consent of instructor. C-L: Anatomy 259 and Biochemistry 259. One course. *Vanaman and staff*
- 260S. Interactions of Differentiated Cells. C-L: Anatomy 260S and Physiology 260S. Half course. *Conn, Jakoi, Padilla, and Vanaman*
- 264S. Chromosomes, DNA, and Evolution. Prerequisite: cell biology or genetics. C-L: Zoology 264S and University Program in Genetics. One course. *Endow and Nicklas*
268. Molecular Biology II: Nucleic Acids. Prerequisites: introductory biochemistry and Microbiology 259 or consent of instructor. C-L: Biochemistry 268 and Botany 268. One course. *Modrich and staff*
269. Advanced Cell Biology. Prerequisite: introductory cell biology or consent of instructor. C-L: Anatomy 269, Botany 269, and Zoology 269. One course. *Nicklas and staff*

Physiology (PHS)

102. Basic Human Physiology. Half course. *McHale*
200. Introduction to Physiology. Prerequisite: consent of instructor. Two courses. *Staff*
204. Introduction to Modern Physiology. Prerequisites: Physiology 200 or equivalent and consent of instructor. One course. *Blum and staff*
208. Respiratory System in Health and Disease. Half course. *Salzano and Kylstra*
210. Individual Study. Prerequisites: senior standing and consent of Director of Undergraduate Studies. Credit to be arranged. *Staff*
217. Membrane Transport. Half course. *Mandel and staff*
- 219S. Membrane Physiology. Given at Beaufort. Half course. *Gutknecht*
230. Molecular and Cellular Bases of Differentiation. C-L: Anatomy 219. One course. *Padilla and staff*
- 260S. Interactions of Differentiated Cells. C-L: Anatomy 260S and Microbiology and Immunology 260S. Half course. *Conn, Jakoi, Padilla, and Vanaman*
270. Neurobiology I. Prerequisites: Biochemistry 227 and 228 or equivalents. C-L: Anatomy 270. One course. *Moore and staff*
- 272S. Physiology of the Central Nervous System. Prerequisites: Physiology 200 or equivalent and Physiology 270 or equivalent, and some knowledge of neuroanatomy; for undergraduates, consent of instructor also. C-L: Psychology 272S. Half or one course. *Somjen and staff*

Courses Currently Unscheduled

203. Introduction to Biophysics and Biophysical Chemistry

Medieval and Renaissance Studies Program

Professor Steinmetz, *Director*; Associate Professor Seebass, *Director of Undergraduate Studies*

The Program in Medieval and Renaissance Studies is designed to provide the student with a well-rounded understanding of the historical, cultural, and social forces that shaped the medieval and Renaissance periods. The program is divided into four areas of study: fine arts (art and musicology); history; language and literature (English, French, German, Greek, Italian, Latin, and Spanish); and philosophy-religion. An interdisciplinary major is offered. See the section on the major below.

The courses listed below are among those now available in the program, and they are described under the listings of the specified departments.

Art

- 130. Early Medieval Art. *Epstein*
- 131. Byzantine Art and Architecture. *Epstein*
- 132. Romanesque Art. *Bruzelius*
- 133. Gothic Art. *Bruzelius*
- 134. Medieval Architecture. *Bruzelius*
- 135. Gothic Cathedrals. *Bruzelius*
- 140. Giotto and the Origins of the Renaissance. *Goffen*
- 141. Fifteenth-Century Italian Art. *Goffen or Spencer*
- 142. Sixteenth-Century Italian Art. *Goffen or Spencer*
- 143. Classical Tradition in the Renaissance. *Goffen*
- 144. Central Italian Art. *Goffen*
- 147. Venetian Art: Fifteenth Century to the Eighteenth Century. *Goffen*
- 148. Art of Northern Europe in the Fifteenth and Sixteenth Centuries. *Staff*
- 149. Death in Art. *Goffen*
- 230S. Medieval and Byzantine Art and Architecture. *Bruzelius or Epstein*
- 242S. Studies in Italian Renaissance Art. *Goffen or Spencer*

Classical Studies

- 117. Ancient Mythographers. *Newton*

English

- 121. Medieval English Literature to 1500. *Nygard*
- 122. Sixteenth-Century English Literature. *DeNeef*
- 123. English Literature: 1600 to 1660. *DeNeef or Randall*
- 141. Chaucer. *DeNeef or Nygard*
- 143, 144. Shakespeare. *DeNeef, Jones, Porter, or G. Williams*
- 145. Milton. *DeNeef or Price*
- 207. Old English Language and Literature. *Nygard*
- 208. History of the English Language. *Butters or Nygard*
- 221. Renaissance Prose and Poetry: 1500 to 1660. *DeNeef, Randall, or G. Williams*
- 225. Renaissance Drama: 1500 to 1642. *Randall or G. Williams*

French

- 145S. The Sixteenth Century. *Tetel*
- 146S. Montaigne and Self-Portraiture. *Tetel*
- 148. French Drama of the Seventeenth Century. *Staff*
- 240. Old French Literature. *Staff*
- 248. French Literature of the Seventeenth Century. *Staff*

German

- 205, 206. Middle High German. *Rosenberg*
- 215S. Seventeenth-Century Literature. *Borchardt*
- 216. History of the German Language. *Rosenberg*
- 217S. Renaissance and Reformation Literature. *Borchardt*

History

- 104. The Intellectual Life of Europe, 1250-1600. *Witt*
- 105. Political and Constitutional History of England. *Staff*
- 107. Social and Cultural History of England. *Ferguson*
- 117, 118. Early Modern Europe. *Neuschel or Robisheaux*
- 133. Medieval Europe, 300-1000 A.D. *Young*
- 134. Medieval Europe, 1000-1400 A.D. *Young*
- 173. History of Spain from Late Medieval Times to Present. *TePaske*
- 174. History of Colonial Hispanic America from Pre-Columbian Times to the Wars of Independence. *TePaske*
- 195S.01-196S.01. Renaissance Intellectual History, 1300 to 1600. *Witt*
- 195S.13-196S.13. Elizabethan England. *Ferguson*
- 221. Problems in the Economic and Social History of Europe, 1200-1700. *Witt*
- 222. Problems in European Intellectual History, 1250-1550. *Witt*
- 237S. Europe in the Early Middle Ages. *Young*
- 238S. Europe in the High Middle Ages. *Young*
- 267S-268S. From Medieval to Early Modern England. *Ferguson*

Italian

- 183. Readings in Italian Literature. *Caserta*
- 284. Dante. *Caserta*

Latin

- 87, 88. Sight Reading in Classical, Medieval, and Renaissance Latin. *Staff*
221. Medieval Latin. *Newton*

Music

- 155S. Music History I: Antiquity, Middle Ages, Early Renaissance. *Kirkendale or Seebass*
156S. Music History II: Late Renaissance, Baroque. *Kirkendale or Seebass*
211. Medieval Notation. *Herlinger*
212. Renaissance Notation. *Herlinger*
221. Music in the Middle Ages: Monophony. *Seebass*
222. Music in the Middle Ages: Polyphony. *Seebass*
223. Music in the Renaissance. *Kirkendale*

Philosophy

119. Medieval Philosophy. *Mahoney*
120. Late Medieval and Renaissance Philosophy. *Mahoney*
218S. Medieval Philosophy. *Mahoney*
219S. Late Medieval and Renaissance Philosophy. *Mahoney*

Religion

134. Jewish Mysticism. *Bland*

Spanish

- 108S. Spanish Traditional Poetry. *Garci-Gómez*
151. Spanish Literature of the Renaissance and the Baroque. *Wardropper*
153. Golden Age Literature: Cervantes. *Staff*
157. The Picaresque Novel. *Garci-Gómez*
210. History of the Spanish Language. *Garci-Gómez*
251. The Origins of Spanish Prose Fiction. *Wardropper*
253. Cervantes. *Wardropper*
254. Drama of the Golden Age. *Wardropper*
258S. Spanish Lyric Poetry before 1700. *Wardropper*

THE MAJOR

A major consists of at least eight courses drawn from the nonintroductory courses of the four areas of study (fine arts, history, language and literature, and philosophy-religion). Three courses in each of two areas must be included. Besides the courses specifically listed (under departmental headings) in the medieval and Renaissance periods, provision may be made for independent study in any of the four areas.

Each program is tailored to the needs and interests of the student under the supervision of a committee consisting of faculty members from appropriate departments. After discussion with the Director of Undergraduate Studies for Medieval and Renaissance Studies, the student submits a provisional program of study outlining special interdisciplinary interests. Normally the program is planned well before the end of the sophomore year to allow time to acquire a working knowledge of languages pertinent to specific interests.

Music (MUS)

Professor Douglass, *Chairman*; Assistant Professor Henry, *Director of Undergraduate Studies*; Professors Bone, Bryan, Hanks, Kirkendale, Ward, and Withers; Associate Professors Seebass and Todd; Assistant Professors Bartlet, Herlinger, and Jaffe; Artist-in-Residence Ciompi; Lecturers Love and Smith; Artist Associates Bloom, Raimi, and Taylor; Staff Associates Cubbage, Gilmore, Gress, Hawkins, Johnston, Lail, Marshall, Mizesko, Myers, Peck, Pederson, Ruggero, Thompson, Troxler, and Weddle; Librarian Hammond

THEORY AND COMPOSITION

36. Acoustics and Music. Physical principles underlying musical instruments, room acoustics, and the human ear. Analysis, reproduction, and synthesis of musical sounds. No previous knowledge of physics is necessary. C-L: Physics 36. One course. *Lawson*

55, 56. Introduction to Music Theory. Fundamentals of notation, melodic and harmonic practice, analysis, and score reading, as a basis for independent work. Prerequisite for 55: some ability to read music; for 56: Music 55. Does not count for major requirements. Two courses. *Staff*

65. Fundamentals of Music Theory. Physical properties of sound, principles of diatonic tonal organization, melodic and harmonic constructions, elementary counterpoint, and figured bass. Prerequisite: basic knowledge of musical notation and vocabulary. One course. *Douglass, Herlinger, Jaffe, or Todd*

66. Tonal Harmony. Harmonic language of eighteenth and nineteenth centuries, functional chromaticism, and introduction to musical forms. Prerequisite: Music 65. One course. *Douglass, Herlinger, Jaffe, or Todd*

67S, 68S. Composition I. Composing original music in smaller forms for voice, piano, and other instruments. Studies in compositional techniques. Prerequisites: Music 65 and 66 or consent of instructor. Two courses. *Jaffe*

115S. Modal Counterpoint. Polyphonic practice of the fifteenth and sixteenth centuries; sacred and secular music. Prerequisite: Music 66 or consent of instructor. One course. *Herlinger or Todd*

116S. Tonal Counterpoint. Polyphonic practice of the seventeenth, eighteenth, and nineteenth centuries; sacred and secular music. Prerequisite: Music 115S or consent of instructor. One course. *Herlinger or Todd*

117S, 118S. Analysis I and II. Introduction to techniques for the analysis of music, based on study of selected compositions. Prerequisite for 117S: Music 66 or consent of instructor; for 118S: Music 117S or consent of instructor. One course. *Herlinger or Todd*

122. Orchestration. Characteristics and transpositions of the instruments. Scoring for symphony orchestra; concert band; and string, woodwind, brass, and percussion ensembles from pre-existing piano scores, or the student's original compositions. Prerequisite: Music 116S. One course. *Bryan*

130T, 131T. Performance Practice (Organ) I, II. Analytical and practical study of organ compositions from various epochs. Registration, fingering, pedaling, ornamentation, touch, and *notes inégales* as described in ancient theoretical treatises and comments of composers. Paper and performances required. Prerequisites for 130T: one year of organ instruction at Duke or the equivalent and consent of instructor; for 131T: Music 130T. Two courses. *Douglass*

132T, 133T. Performance Practice (Organ) III, IV. Prerequisite for 132T: Music 131T; for 133T: Music 132T. Two courses. *Douglass*

HISTORY, LITERATURE, AND MUSICOLOGY

74. Introduction to Jazz. A survey examining musical, aesthetic, sociological, and historical aspects. For nonmajors. C-L: Afro-American Studies 74. One course. *Staff*

119. The Humanities and Music. A historical survey of the relationship of significant literary texts to music, exemplifying literary genres and concepts with musical works from antiquity to the nineteenth century. Readings from primary

literary sources, listening to representative musical settings. Does not count for the major in music. One course. *Kirkendale or Seebass*

125. Masterworks of Music. Historical, biographical, and analytical study of works by major composers of the seventeenth through the twentieth centuries. One course. *Staff*

136. Introduction to Non-Western Music. Study of social and religious contexts. Native instruments and related craftsmanship. C-L: Comparative Area Studies. One course. *Seebass*

140. Introduction to Islamic Music. A study of the music and musical instruments in the world of Islam, especially the Middle East, North Africa, Turkey, Iran, central Asia, Afghanistan, and the Indo-Pakistan subcontinent. Aesthetic and technical principles. Prerequisite: Music 136. C-L: Comparative Area Studies. One course. *Siddiqi*

142. The Musical Theater. The development of the musical theater in Western civilization from the late sixteenth century to the present. Relationship of music and text, theater as social commentary, changing forms and styles. C-L: Drama 172. One course. *Ward*

143. Beethoven and His Time. The music of Beethoven and its relation to contemporary, historical, social, and literary developments. Special emphasis on the nine symphonies. One course. *Todd*

155S. Music History I: Antiquity, Middle Ages, Early Renaissance. Prerequisite for music majors: Music 65 or consent of instructor; for nonmajors: consent of instructor. C-L: Medieval and Renaissance Studies. One course. *Kirkendale or Seebass*

156S. Music History II: Late Renaissance, Baroque. Prerequisite for music majors: Music 65 or consent of instructor; for nonmajors: consent of instructor. One course. *Kirkendale or Seebass*

157S. Music History III: Rococo and Classic. Prerequisite for music majors: Music 65 or consent of instructor; for nonmajors: consent of instructor. One course. *Bryan, Kirkendale, or Seebass*

158S. Music History IV: Romanticism to the Early Modern Period. Prerequisite for music majors: Music 65 or consent of instructor; for nonmajors: consent of instructor. One course. *Todd*

160. History of the Organ and Its Literature. Historical survey of the organ from about 1450 to 1950, emphasizing development of the major national styles of building and composition; historical roots of the Flentrop organ. Prerequisite: one course in music theory or literature or consent of instructor. One course. *Douglass*

For Advanced Undergraduates and Graduates

201. Introduction to Musicology. Introduction to and assessment of reference materials, other bibliographic tools, and research methods for the field of musicology. Prerequisite: consent of instructor. One course. *Bartlet or Kirkendale*

211. Medieval Notation. Introduction to codicology and paleography; notation of plain chant and of polyphony through the fourteenth century. One course. *Herlinger*

212. Renaissance Notation. Mannered notation; fifteenth-century white notation; proportions; instrumental scores, partituras, and tablatures. Prerequisite: Music 211 or consent of instructor. One course. *Herlinger*

221. Music in the Middle Ages: Monophony. Selected topics. One course.
Seebass

222. Music in the Middle Ages: Polyphony. Selected topics. One course.
Seebass

223. Music in the Renaissance. Selected topics. One course. *Kirkendale*

224. Music in the Baroque Era. Selected topics. One course. *Douglass or Kirkendale*

225. Music in the Classic Era. Selected topics. One course. *Kirkendale*

226. Music in the Romantic Era. Selected topics. One course. *Todd*

227. Music in the Postromantic and Modern Eras. Selected topics. One course. *Herlinger or Todd*

INDEPENDENT STUDY AND SEMINARS

Admission to these courses will be subject to the approval of the Director of Undergraduate Studies and the instructor. The instructor and course content will be established in accordance with the individual student's interests and capacities.

179, 180. Independent Study in Musical Performance.* Open only to sophomores possessing an exceptional technical and interpretive command of a musical medium. Prerequisites: previous registration in private instruction in applied music at Duke, audition, and consent of instructor. Two courses.
Staff

181, 182. Independent Study in Musical Performance.* Same as 179, 180, but for juniors. Two courses. *Staff*

183, 184. Independent Study in Musical Performance.* Same as 179, 180, but for seniors. Two courses. *Staff*

185S, 186S. Seminars in Music. Primarily for junior and senior music majors. Topics to be announced. Prerequisite: consent of instructor. Two courses.
Staff

191, 192. Independent Study. Directed reading, research, and musical analysis within a prescribed area of musical literature. Open only to qualified students in the junior year by consent of the department. One or two courses. *Staff*

193, 194. Independent Study. Same as 191, 192, but for seniors. One or two courses. *Staff*

MUSIC EDUCATION AND PEDAGOGY

57S, 58S, 59S, 60S. Vocal Diction. Problems of diction for the singer. Study of standard pronunciation with special emphasis on phonetics in Italian, English, German, and French. Four half courses. *Hanks*

128. Instrumental Conducting. Development of techniques of conducting instrumental ensembles with emphasis on orchestral repertoire. Score reading and analysis, principles of interpretation, and practical conducting experience. Prerequisite: Music 116S or consent of instructor. One course. *Bone*

129. Choral Conducting. Development of techniques of conducting vocal repertoire, ranging from church anthems to large-scale works. Score reading and analysis, principles of interpretation, and practical conducting experience. Prerequisite: Music 116S or consent of instructor. One course. *Smith*

*The schedule of fees for private lessons, as published in the subsection on fees, is applicable to courses 179, 180, 181, 182, 183, 184.

151. Public School Music Education I (Elementary). C-L: Education 151.
Half course. *Staff*

152. Public School Music Education II (Elementary). C-L: Education 152.
Half course. *Staff*

APPLIED MUSIC

The study of applied music promotes the understanding of music literature through performance. A limited number of students may receive private instruction in instruments and voice for Duke University credit, providing they qualify by audition. Prior to registration students must arrange an audition, either in person or by tape recording, with the instructor. For those students who wish to study privately but do not qualify for university level instruction, a list of music teachers in the immediate area who are available to Duke students can be obtained from the music department office. Class instruction is offered in small and large ensembles. All courses may be repeated for credit. Not more than two ensembles may be taken concurrently for credit.

Instruction: half hour, quarter course credit

- 79. Class Voice. *Staff*
- 80. Piano. *Hawkins, Love, Ruggero, or Withers*
- 81. Strings. *Bloom, Ciompi, Cabbage, Taylor, or Raimi*
- 82. Woodwinds. *Gilmore, Henry, Pederson, Troxler, or Weddle*
- 83. Brass. *Bryan, Gress, Mizesko, or Meyers*
- 85. Voice. *Hanks, Lail, or Peck*
- 86. Organ. *Douglass or Marshall*
- 87. Harpsicord. *Marshall*

Instruction: 1 hour, half course credit

- 90. Piano. *Hawkins, Love, Ruggero, or Withers*
- 91. Strings. *Bloom, Ciompi, Cabbage, Taylor, or Raimi*
- 92. Woodwinds. *Gilmore, Henry, Pederson, Troxler, or Weddle*
- 93. Brass. *Bryan, Gress, Mizesko, or Meyers*
- 95. Voice. *Hanks, Lail, or Peck*
- 96. Organ. *Douglass or Marshall*
- 97. Harpsicord. *Marshall*

Ensemble Classes: quarter course credit; pass/fail

- 100. Symphony Orchestra. *Bone*
- 101. Wind Symphony. *Bryan*
- 102. Marching Band. *Henry*
- 104. String Ensemble. *Staff*
- 110. Collegium Musicum. *Herlinger*
- 111. Opera Workshop. *Hanks*
- 112. Chapel Choir. *Smith*
- 113. Chorale. *Smith*

Credit in Applied Music. (Skills courses—credit not applicable to distributional requirements.)* Credit for instruction in courses below 100 is granted on the basis of a half course per semester for one hour of private instruction per week and a minimum of six hours practice weekly; or a half course per year for one half hour of private instruction or one period of class study and a minimum of six hours practice per week. An additional weekly class meeting for performance and criticism may be required by the instructor without additional credit. Credit for instruction in courses above 99 is granted on the basis of a half course per year for

*Subject to instructor's approval, a student at an advanced level in applied music may take courses for tutorial and distributional requirements. These courses shall be designated by adding a T to the appropriate course number. Students who have not reached an advanced level will continue to take the regular applied music courses.

one rehearsal period of instruction and a minimum of three hours practice per week. In the summer terms, credit is awarded on the basis of a comparable amount of time in instruction and practice time.

Fees. Applied music instruction in one medium (instrument or voice) is offered free to music majors (declared first majors). Additional instruction for music majors and all instruction for nonmajors will be charged as follows:

One half-hour private lesson per week for one semester \$100

One one-hour private lesson per week for one semester \$200

One half-hour class lesson per week for one semester \$60

Registration in ensemble classes (Music 100-104, 110-113) Free

No charge is made for practice room facilities for students registered for private or class lessons in applied music. A fee schedule for the use of facilities by others not registered for applied lessons is available from the music department office.

Fees are not refundable after the final drop/add day.

COURSES CURRENTLY UNSCHEDULED

84. Percussion

94. Percussion

103. Jazz Ensemble

138. The Music of Southeast Asia

139. Twentieth-Century Music

165. Opera in Vienna

THE MAJOR

Prerequisites. Music 65, 66, and one year of applied music study in instrument or voice. Any or all of these may be exempted through demonstration of proficiency by examination and/or audition.

Major Requirements. Music 115S, 116S, 155S, 156S, 157S, 158S, and one additional elective course in the department. Those who plan to study music beyond the undergraduate level are strongly advised to prepare themselves in two or more foreign languages.

Honors. Majors who are qualified (see the section on honors in this bulletin) may undertake work leading to graduation with distinction in music by application to the Director of Undergraduate Studies. Honors work usually involves participation in an appropriate senior seminar and/or independent study. It must culminate in a paper, historical or analytical, either full length by itself or somewhat more concise if offered in conjunction with a recital or composition. The paper must be approved by a faculty committee.

Naval Science

For courses in naval science, see Reserve Officers Training Program.

Philosophy (PHL)

Professor Golding, *Chairman*; Assistant Professor Wartenberg, *Director of Undergraduate Studies*; Professors Mahoney, Peach, and Sanford; Associate Professors Posy and Roberts; Assistant Professors Brandon and Jackson; Professor Emeritus Welsh; Adjunct Associate Professor Ward

The undergraduate program in the Department of Philosophy acquaints students with the content and the structure of philosophical theory in various

areas. Discussion is encouraged so that students can engage actively in the philosophical examination of problems.

Course offerings fall into two general categories: the systematic and the historical. In a systematic treatment, the organization of a course is primarily in terms of the problems presented by the subject matter of that course, as in logic, ethics, and metaphysics. In historical courses, attention is directed more to the order of development in the thought of a particular philosopher (Plato, Aristotle, Kant) or in a historical period. In all courses, reading of the works of philosophers acquaints the students with the important and influential contributions to the definition and solution of philosophical issues.

The problems raised in philosophy in respect to the various fields of the arts and sciences involve questions which are not normally given attention in those particular disciplines. In the consideration of such problems, therefore, it is expected that students will acquire some understanding and perspective of the major areas of the human intellectual endeavor. In this sense, philosophical comprehension is an essential part of a student's learning and education.

Philosophy provides a sound preparation for the demands of many professions. For example, the precision of argument and broad acquaintance with intellectual traditions emphasized in philosophy form an excellent basis for the study of law.

Only one course from among Philosophy 41, 42, 43S, and 44S may be taken for credit. These courses are not open to juniors and seniors.

41. Introduction to Philosophy. Examination of problems in philosophy; emphasis on metaphysics and theory of knowledge. One course. *Staff*

42. Introduction to Philosophy. Examination of problems in philosophy; emphasis on ethics and value theory. One course. *Staff*

43S. Introduction to Philosophy. Philosophy 41 conducted as a seminar. One course. *Staff*

44S. Introduction to Philosophy. Philosophy 42 conducted as a seminar. One course. *Staff*

48. Logic. The conditions of effective thinking and clear communication. Examination of the basic principles of deductive reasoning. One course. *Brandon, Posy, Sanford, or Welsh*

93. History of Ancient Philosophy. The pre-Socratics, Socrates, Plato, Aristotle, and post-Aristotelian systems. Prerequisites for freshmen: previous philosophy course and consent of instructor. One course. *Mahoney or staff*

94. History of Modern Philosophy. Bacon, Hobbes, Descartes, Spinoza, Leibnitz, Locke, Berkeley, Hume, and Kant. Prerequisites for freshmen: previous philosophy course and consent of instructor. One course. *Peach, Posy, or Wartenberg*

101. Philosophy of Religion. Selected concepts and doctrines. One course. *Roberts*

102. Aesthetics: The Philosophy of Art. The concept of beauty, the work of art, the function of art, art and society, the analysis of a work of art, criticism in the arts. One course. *Staff*

103. Symbolic Logic. Detailed analysis of deduction and of deductive systems. Open to sophomores by consent of instructor. C-L: Linguistics. One course. *Brandon or Posy*

104. Philosophy of Science. The principal philosophical and methodological problems in contemporary science. One course. *Brandon*

- 105. Philosophy of History.** History as a form of inquiry, problems of explanation, objectivity and the historical individual, general interpretations of the historical process. One course. *Roberts*
- 106. Philosophy of Law.** Natural law theory, legal positivism, legal realism, the relation of law and morality. One course. *Golding*
- 107. Political and Social Philosophy.** The fundamental principles of political and social organizations. One course. *Mahoney*
- 108. Social Ideals and Utopias.** Reading of selected Utopias; analysis of the value structures and political principles of these ideal societies. One course. *Wartenberg*
- 109. Philosophy of Language.** A philosophical analysis of problems arising in the study of language and symbolism. Topics include: theories of language, the nature of signs and symbols, theories of meaning, types of discourse (scientific, mathematical, poetic), definition, ambiguity, metaphor. C-L: Linguistics. One course. *Posy*
- 110. Knowledge and Certainty.** Problems in the theory of knowledge: conditions of knowledge, scepticism, perception, memory, induction, knowledge of other minds, and knowledge of necessary truths. One course. *Roberts or Sanford*
- 111. Appearance and Reality.** Problems in metaphysics: theories of existence, substance, universals, identity, space, time, causality, determinism and action, and the relation of mind and body. One course. *Sanford*
- 112. Philosophy of Mind.** Such topics as mind and body, thought, perception, persons, and personal identity. One course. *Roberts or Sanford*
- 113. Philosophy of Mathematics.** Survey of mathematical thought including the nature of infinity, Platonism, constructivism, and the foundational crisis of the early twentieth century. Prerequisite: one course in calculus or logic or philosophy; or consent of instructor. One course. *Posy*
- 116. Systematic Ethics.** Problems in moral philosophy: the nature of morality, ethical relativism, egoism, utilitarianism. Both historical and contemporary readings, with emphasis on the latter. One course. *Golding or Jackson*
- 117. Ancient and Modern Ethical Theories.** The development of ethical thought in the West; the interaction between culture and ethical theory, with special reference to the Greek city-state, Roman law, the Renaissance, the Reformation, and the rise of modern science. Readings in the great ethical philosophers. One course. *Jackson*
- 118. Philosophical Issues in Medical Ethics.** Ethical issues arising in connection with medical practice and research and medical technology. Definition of health and illness; experimentation and consent; genetic counseling and biological engineering; abortion, contraception, and sterilization; death and dying; codes of professional conduct; and the allocation of scarce medical resources. Prerequisites for freshmen: previous philosophy course and consent of instructor. One course. *Golding, Jackson, or Roberts*
- 119. Medieval Philosophy.** Christian, Islamic, and Jewish philosophy from late antiquity to 1300. Special emphasis on historical influences and institutional developments. Nature and destiny of humans, existence and nature of God, problem of ethical norms, political philosophy. C-L: Medieval and Renaissance Studies. One course. *Mahoney*
- 120. Late Medieval and Renaissance Philosophy.** Problems of political authority and nature of the state, mysticism, humanism, critical trends, back-

ground of Galileo, and impact of the Reformation related to cultural and institutional changes. C-L: Medieval and Renaissance Studies. One course. *Mahoney*

121. Philosophy and Film. Philosophical examination of the film as a mode of representing reality and its place in contemporary society. Weekly films and class discussion. C-L: Film. One course. *Wartenberg*

122. Philosophical Issues in Feminism. Issues in political and moral philosophy in their bearing on feminist concerns, including political equality and rights, preferential treatment, feminist and nonfeminist critiques of pornography, and the morality of abortion. One course. *Jackson*

132. Nineteenth-Century Philosophy. Emphasis on Hegel, Marx, and Nietzsche. One course. *Wartenberg*

134. Existentialism. One or more major texts, such as Sartre's *Being and Nothingness*. One course. *Roberts or Ward*

135. Philosophy in Literature. Comparative examination of philosophical topics such as freedom, responsibility, good and evil, time and reality. One course. *Roberts*

191, 192, 193, 194. Independent Study. Directed reading and research. Open only to highly qualified students in the junior and senior year with consent of the department. *Staff*

For Seniors and Graduates

203S. Contemporary Ethical Theories. The nature and justification of basic ethical concepts in the light of the chief ethical theories of twentieth-century British and American philosophers. One course. *Golding or Jackson*

204S. Philosophy of Law. Natural law theory and positivism; the idea of obligation (legal, political, social, moral); and the relation of law and morality. One course. *Golding*

206S. Responsibility. The relationship between responsibility in the law and moral blameworthiness; excuses and defenses; the roles of such concepts as act, intention, motive, ignorance, and causation. One course. *Golding*

208S. Political Values. Analysis of the systematic justification of political principles and the political values in the administration of law. One course. *Golding or Wartenberg*

211S. Plato. Selected dialogues. One course. *Staff*

217S. Aristotle. *Metaphysics* or the *Nicomachean Ethics*. One course. *Staff*

218S. Medieval Philosophy. Selected problems. C-L: Medieval and Renaissance Studies. One course. *Mahoney*

219S. Late Medieval and Renaissance Philosophy. Selected problems. C-L: Medieval and Renaissance Studies. One course. *Mahoney*

225S. British Empiricism. A critical study of the writings of Locke, Berkeley, or Hume with special emphasis on problems in the theory of knowledge. One course. *Peach*

227S. Continental Rationalism. A critical study of the writings of Descartes, Spinoza, or Leibniz with special emphasis on problems in the theory of knowledge and metaphysics. One course. *Peach*

228S. Recent and Contemporary Philosophy. A critical study of some contemporary movements, with special emphasis on analytic philosophers. One course. *Posy or Wartenberg*

231S. Kant's Critique of Pure Reason. One course. *Wartenberg*

233S. Methodology of the Empirical Sciences. Recent philosophical discussion of the concept of a scientific explanation, the nature of laws, theory and observation, probability and induction, and other topics. Prerequisite: consent of instructor. One course. *Brandon*

234S. Problems in the Philosophy of Science. Selected problems in the physical and nonphysical sciences such as space and time, measurement and determinism. Prerequisite: consent of instructor. One course. *Brandon*

235S. Hegel and Marx. Hegel's philosophy and its influence on Marx. One course. *Wartenberg*

251S. Epistemology. Selected topics in the theory of knowledge, e.g., conditions of knowledge, scepticism and certainty, perception, memory, knowledge of other minds, and knowledge of necessary truths. One course. *Sanford*

252S. Metaphysics. Selected topics: substance, qualities and universals, identity, space, time, causation, and determinism. One course. *Sanford*

253S. Philosophy of Mind. Analysis of concepts such as thought and belief; issues such as mind-body relations, thought and action, the nature of persons, and personal identity. One course. *Roberts or Sanford*

254S. Philosophy of Religion. Topics such as proofs of the existence of God; meaningfulness of religious language; the problems of evil, immortality, and resurrection. One course. *Roberts*

COURSES CURRENTLY UNSCHEDULED

156. Justice and Society

167S. Professional Ethics

196S, 197S, 198S, 199S. Seminars in Philosophy

202S. Aesthetics: The Philosophy of Art

205S. Philosophy of History

232S. Recent Continental Philosophy

291S, 292S. Special Fields of Philosophy

THE MAJOR

Major Requirements. Eight courses in philosophy of which at least six must be numbered above 48. The following must be included: Philosophy 93 and 94; one nonintroductory course in theory of value. Philosophy 48 is recommended, though not required.

Related Work. Two courses minimum in each of two departments approved by the philosophy adviser. Courses may not be those primarily open to freshmen. There is no restriction in principle as to departments in which related work may be taken, and the approval of the philosophy adviser is required only to insure some coherence in the program of major and related work as a whole.

Honors. The department offers work leading to graduation with distinction. See the section on honors in this bulletin.

Physics (PHY)

Professor Lewis, *Chairman*; Professor Evans, *Director of Undergraduate Studies*; Professors Biedenharn, Bilpuch, Cusson, Fairbank, Han, Meyer, Roberson, Robinson,

Walker, Walter, and Weller; Associate Professors De Lucia, Fortney, Goshaw, and Herbst; Assistant Professors Behringer, Byrd, Lucas, and Palmer; Adjunct Professors Guenther and Rogosa; Adjunct Assistant Professors Kolena, Lawson, and Nelson; Instructors Kowald and Messer

By studying physics the student learns the methods and results of a systematic examination of the objects that make up the natural universe and of their interactions with each other. The knowledge and analytical skills thus obtained are basic to the study of the sciences and engineering. The department offers a number of courses for the nonspecialist who wishes to learn about the physicist's description of nature for its intrinsic intellectual value.

32. History of Physics. Theories including Newtonian mechanics, atomic structure, quantum theory, relativity, nuclear and particle physics; their developers and technological applications. No previous knowledge of physics assumed. One course. *Walker*

33. Energy: Principles, Problems, Alternatives. Basic principles of physics as related to energy, the energy crisis, possible sources and alternatives. Conservation and environmental aspects of energy consumption. Optional special topics laboratory. No previous knowledge of physics assumed. One course. *Robinson*

41, 42. Fundamentals of Physics. For students interested in majoring in physics; taken in the freshman year. Basic principles of physics, mainly classical, at a level similar to Physics 51, 52, but with emphasis on laying a foundation for further study. Lecture, recitations, and laboratory. Closed to students having credit for Physics 51, 52. Prerequisite: consent of Director of Undergraduate Studies; Mathematics 31 and 32 may be taken concurrently. Two courses. *Palmer*

51, 52. General Physics. Basic principles of general physics treated quantitatively. Designed for students entering medicine, engineering, and the sciences. Not open for credit to students who have completed Physics 41, 42. Students planning to major in physics should enroll in Physics 41, 42 in their freshman year. Prerequisites: Mathematics 31 and 32 or equivalents; Mathematics 32 may be taken concurrently with Physics 51. Two courses. *Staff*

55. Introduction to Astronomy. The evolving theory of the physical universe. Cosmological models, galaxies, stars, interstellar matter, the solar system, and experimental techniques and results. Several observatory sessions. One course. *Herbst or Kolena*

100. Introduction to Modern Physics. Survey of modern physics including relativity and the quantum physics of atoms, nuclei, particles, and quarks. Does not count for the physics major. Prerequisites: Physics 51, 52 or 41, 42 and Mathematics 103 (may be taken concurrently). One course. *Han*

102. Applications of Modern Physics in Medicine. Recent applications of physical phenomena in medical investigations including lasers, ultrasonics, X-rays, radioactivity, radiation therapy, cryogenics, and electronic techniques. Prerequisite: Physics 41, 42 or 51, 52. One course. *Walter*

105. Introduction to Astrophysics. Basic principles of astronomy treated quantitatively. Cosmological models, galaxies, stars, interstellar matter, the solar system, and experimental techniques and results. Prerequisites: Mathematics 31 and Physics 51, 52 or consent of the instructor. One course. *De Lucia or Herbst*

143. Optics and Modern Physics. Continuation of Physics 41, 42 with more advanced mathematical treatment of selected areas of classical and modern physics. Lecture, recitation, and laboratory. Prerequisites: Physics 41, 42 or 51, 52 and Mathematics 103 (may be taken concurrently). One course. *Goshaw*

171. Electronics. Elements of electronics including circuits, transfer functions, solid-state devices, transistor circuits, operational amplifier applications, digital circuits, and computer interfaces. Lectures and laboratory. Prerequisite: Physics 41, 42 or 51, 52. One course. *Fortney*

176S. Thermodynamics and Kinetic Theory. Thermodynamics, kinetic theory, and elementary statistical mechanics. Prerequisites: Physics 41, 42 or 51, 52 and differential and integral calculus. One course. *Meyer*

181. Introductory Mechanics. Newtonian mechanics at the intermediate level, Lagrangian mechanics, linear oscillations, special relativity. Prerequisites: Physics 41, 42 or 51, 52 and differential and integral calculus. One course. *Han*

182. Electricity and Magnetism. Electrostatic fields and potentials, boundary value problems, magnetic induction, energy in electromagnetic fields, Maxwell's equations, introduction to electromagnetic radiation. One course. *Cusson*

185, 186. Modern Optics. Optical processes including the propagation of light, coherence, interference, and diffraction. Consideration of the optical properties of solids with applications to modern optical devices. Second semester will emphasize nonlinear interactions, optical modulators, lasers, and spectroscopy. Lecture and laboratory projects. C-L for 185: Electrical Engineering 213. Two courses. *Guenther or Hacker*

For Seniors and Graduates

211, 212. Modern Physics. Fundamental concepts of quantum theory and the study of quantum phenomena including atomic and molecular structure and spectra, solids, statistical physics, nuclear physics, and elementary particles. Prerequisite: Physics 181; for 212: Mathematics 111 as a corequisite. Two courses. *Herbst or Robinson*

214. Introduction to Solid-State Physics. C-L: Electrical Engineering 214. One course. *Hacker*

215. Introduction to Quantum Mechanics. Wave mechanics and elementary applications, the hydrogen-like atoms, electron spin and angular momentum, operators and eigenvalues, stationary state perturbation theory, identical particles. Prerequisites: Physics 143 and 181 and Mathematics 111 and 114 (may be taken concurrently). One course. *Biedenharn*

217S, 218S. Advanced Physics Laboratory and Seminar. Experiments involving the fields of electricity, magnetism, heat, optics, and modern physics. Two courses. *Meyer*

225, 226. Elementary Investigations. Training in the laboratory and library methods of physical research. Qualified students may conduct elementary investigations under the supervision of a member of the staff. Two courses. *Staff*

240. Computer Applications to Physical Measurement. Hardware and software techniques for computer-assisted data acquisition, display, and control in the modern experimental environment. Theory and application of discrete signal analysis including digital filters, Z-transform, and fast Fourier transform. Lecture and laboratory. Prerequisite: Physics 171 or consent of instructor. One course. *Fortney*

COURSES CURRENTLY UNSCHEDULED

36. Acoustics and Music

106. Topics in Astrophysics

255. Astronomy for Teachers

THE MAJOR

Students majoring in physics are prepared for work in industrial and governmental laboratories. They are also prepared for graduate work in physics or for the study of medicine.

Students planning to major in physics should enroll in Physics 41, 42 in their freshman year. They should also arrange to complete the necessary mathematics as soon as possible.

For the A.B. Degree

Prerequisites. Physics 41, 42 or 51, 52, or equivalents; Mathematics 31, 32, 103, 111, or equivalents; and one additional course at the 100 or 200 level.

Major Requirements. Physics 143, 171, 176S, 181, and two other courses in physics at the 100 or 200 level.

For the B.S. Degree

Prerequisites. Physics 41, 42 or 51, 52, or equivalents; Mathematics 31, 32, 103, 111, or equivalents; and one additional course at the 100 or 200 level.

Major Requirements. Physics 143, 171, 176S, 181, 182, 211, and two other courses in physics at the 100 or 200 level, at least one of which must be a laboratory course. Students planning graduate study in physics are urged to take two additional electives in physics and two in mathematics.

Honors

The department offers seniors the possibility of being associated with research conducted in the department. This work may lead to graduation with distinction. See the section on honors in this bulletin.

Polish

For courses in Polish, see Slavic Languages and Literatures.

Political Science (PS)

Professor Holsti, *Chairman*; Associate Professor Valenzuela, *Director of Undergraduate Studies*; Professors Barber, Braibanti, Cleaveland, Fish, Hall, Horowitz, Hough, Kornberg, Leach, Paletz, Price, and Spragens; Associate Professors Eldridge, Johns, Lange, and McKean; Assistant Professors Entman, Falcone, Grieco, Hoadley, and Kruzell; Professors Emeriti Ball, Cole, Grzybowski, Hallowell, Kulski, and Simpson; Part-time Associate Professor O'Barr

Courses in political science for undergraduates are offered in four fields: (1) American government, politics, and public administration; (2) comparative government and politics; (3) political theory and methodology; and (4) international law, relations, and politics. In each field, a course numbered at the 90 level serves as an introduction both to the study of political science and to the subject matter and approaches of the field, and middle and upper level courses and seminars (numbered at the 100 and 200 levels respectively) consider particular aspects and topics within the field. In addition, independent study under faculty supervision enables students to explore topics of special interest. See below for the listing of courses by fields, information on internships, and requirements for the major and honors.

INTRODUCTORY COURSES

The following courses introduce the study of political science, and each serves as the basic course in one of the four fields of the discipline. Students ordinarily

will take at least one of these courses before proceeding to more advanced courses. Some advanced courses may require a particular introductory course as a prerequisite.

91. The American Political System. Theory and practice of American government and politics; federal-state relations; the separation and interrelationships of the executive, legislative, and judicial branches of government; judicial review; the role of political parties and public opinion; the formulation and execution of domestic and foreign policy; civil liberties. One course. *Staff*

91D. The American Political System. Same as Political Science 91 except instruction is provided in two lectures and one small discussion meeting each week. One course. *Staff*

92. Comparative Politics. Topics include problems of conceptualization and analysis; foundation of politics under democratic, authoritarian, and totalitarian regimes; theories of development and underdevelopment; revolution and collective violence; the role of elites, such as the military. C-L: Comparative Area Studies. One course. *Valenzuela*

93. Elements of International Relations. The nature of international politics, the analysis of national power, the instruments of foreign policy, and the controls of state behavior. C-L: Comparative Area Studies. One course. *Kruzel*

93D. Elements of International Relations. Same as Political Science 93 except instruction is provided in two lectures and one small discussion meeting each week. C-L: Comparative Area Studies. One course. *Kruzel*

94. Contemporary Political Ideologies. Liberalism, socialism, Marxism and its variants, fascism, contemporary democratic theory. One course. *Spragens*

OTHER UNDERGRADUATE COURSES

100. Politics of Liberties. Theory and development of the Bill of Rights with attention to Supreme Court decisions and to cultural and political forces. One course. *Fish*

107. Comparative Environmental Policies. Comparative analysis of environmental problems and policies in politically diverse industrialized nations including the United States, Russia, and Japan. C-L: Comparative Area Studies and Public Policy Studies 107. One course. *McKean*

108. The American Presidency. The presidency and its impact on the American political system. One course. *Paletz*

109. State and Local Government Today. Problems in state, county, and city government. One course. *Leach*

111. Contemporary Japanese Politics. Introduction to political change in postwar Japan. Foundations of the modern industrial state, electoral politics, policy making and bureaucracy, defense, foreign policy, and foreign trade. C-L: Comparative Area Studies. One course. *McKean*

112S. Shaping the News. C-L: Public Policy Studies 186S. One course. *Barber*

113. International Political Economy. The interplay between politics and economics in international trade, money, investment, and technology flows among advanced capitalist societies, between developed and developing countries, and between capitalist and socialist countries. One course. *Grieco*

114. United States Foreign Policy and Latin America. The postwar period: the Alliance for Progress, counter-insurgency, human rights, Cuba. Particular

attention to the United States response to Latin American democracies, dictatorships, and revolutionary movements. One course. *Valenzuela*

118. American Constitutional Development. Prerequisite: Political Science 91 or 91D or consent of instructor. One course. *Fish*

120. International Conflict and Violence. Nature and processes of international conflict and violence with emphasis on contemporary instances of violence in international affairs. Consideration of restraints on violence. C-L: Comparative Area Studies. One course. *Eldridge*

121. International Organization. Political aspects of military and economic organizations at the global and regional levels of the international system. One course. *Grieco*

122. Modern International Politics. The major problems in contemporary international affairs with attention to superpower politics, specific regional concerns, and the problems associated with the emergence of a new international economic order. C-L: Comparative Area Studies. One course. *Eldridge*

123. Introduction to Political Philosophy. The nature and enduring problems of political philosophy, illustrated by selected theorists in the Western political tradition. One course. *Spragens*

126. Democratic Theory and Political Reality. Normative goals and empirical analysis of existing democratic states. One course. *Spragens*

127. Law and Politics. Nature and functions of law; Anglo-American legal institutions; the process of judicial decision making; and the relationships among judges, lawyers, legislators, and administrators in the development of public as well as private law. One course. *Fish*

128. Congress and the Presidency. Policy making in the executive and legislative branches of the United States government, with particular attention to intragovernmental relations. One course. *Price*

129. Political Participation. The motives, methods, and results of the activities of individuals and groups and of social movements. One course. *Palez*

131. Introduction to American Political Thought. Basic elements in the American political tradition as developed from its English roots to the present. One course. *Leach*

136. Comparative Government and Politics: Western Europe. Modern political institutions and processes of Britain, France, Germany, and at least one of the smaller European democracies. Political consequences of divergent patterns of social and economic modernization; regional, religious, and class divisions; the modern role of parliaments; authoritarian, democratic, and pluralist alternatives in contemporary European societies. One course. *Lange*

137. Political Behavior in Elections. An introduction to voting and elections in the United States, with emphasis on presidential nomination and election procedures, characteristics of the American electorate, and theories of voting behavior in presidential and congressional elections. One course. *Hoadley*

138. Quantitative Political Analysis I. Basic applications of statistical methods to the analysis of political phenomena. Emphasis on research design, descriptive and inferential statistics, and use of computers. Not open to students who have had or are enrolled in Political Science 236, Economics 138, Mathematics 53 or 117, Psychology 117, Public Policy Studies 112 or 222, or Sociology 132 or 293. One course. *Hoadley*

140. Administrative Law and Government. Fundamentals of the American system of law and government as reflected in the administrative process. One course. *Staff*

141. Public Administration. An introduction to the role of administration in the governmental process considering principles of administrative organization, methods of administrative control, personnel, and fiscal management. In general, the study of the organizational and administrative problems encountered by any government agency charged with carrying out public policy. One course. *Cleaveland*

144S. American Political Thought since the Gilded Age. The Progressive period and the recurring themes of contemporary debate. Attempts to refurbish or develop alternatives to the dominant liberal tradition. The ideological roots of black, feminist, and conservative protest. One course. *Price*

145. Political Analysis for Public Policy Making. C-L: Public Policy Studies 114. One course. *Entman and Hawes*

146. American Legislative Behavior. An introduction to the American legislative process, with specific focus on the U.S. Congress. Emphasis on legislative rules and procedures, congressional elections, and the behavior of legislators in their representative and policy-making roles. One course. *Hoadley*

149. United States and East Asia. American military intervention in China, Korea, and Vietnam; contemporary United States relations with Japan, China, and other Asian nations; new trends and sources of tension in East Asia and the Pacific. C-L: Comparative Area Studies. One course. *McKean*

151. Introduction to Latin American Politics. Historical and cultural context of political institutions and behavior, the role of traditional and emerging groups and forces, political instability and the decision-making process. C-L: Comparative Area Studies. One course. *Valenzuela*

153, 154. Politics and the Media of Mass Communication. Analysis of the nature, organization, and products of the mass media (especially the movie, television, and newspaper industries) as they affect the political systems, political processes, institutions, and people of the United States and other nations. It is desirable but not required that students taking 153 continue with 154. With consent of the instructor, students who have not taken 153 may enroll in 154. C-L: Film. Two courses. *Paletz*

157. Foreign Policy of the United States. Sources of American foreign policy, containment, international economic policy, deterrence, arms control, and disarmament. Prospects for the future. Emphasis on the period since World War II. C-L: Comparative Area Studies. One course. *Holsti*

160. Contemporary International Problems: Their Historical Origins and Their Implications for Future Policy. C-L: History 109, Interdisciplinary Course 109, Religion 156, and Sociology 175. One course. *Staff*

161. Comparative Government and Politics: Africa. Nationalism, nation building, and problems of development in sub-Saharan Africa. C-L: Comparative Area Studies. One course. *Johns*

163. Women in Developing Societies. Comparative analysis of factors related to the political power of Third World women in precolonial, colonial, and contemporary times. C-L: Comparative Area Studies. One course. *O'Barr*

164. Presidential Management of the Executive Branch. The modern institutional presidency. Emphasis on program planning, administration, and implementation of national domestic policy. Prerequisite: Political Science 91 or 91D or consent of the instructor. One course. *Cleaveland*

165. Government and Politics of the Soviet Union. Analysis of the Soviet political system, emphasizing the sources of stability and instability and the

responsiveness of its policies. Literature on the non-Soviet world (notably the United States) will be included. C-L: Comparative Area Studies. One course. *Hough*

166. Soviet Foreign Relations. Nature of relations with other states. Determinants and formulation of foreign policy. C-L: Comparative Area Studies. One course. *Hough*

169. Politics in Revolutionary China. Political process in China since 1949, with emphasis on ideological shifts in the Cultural Revolution and the post-Mao era. Party politics, leadership, economic organization, thought reform, mass mobilization, and socialist transformation. China as an emerging world power. C-L: Comparative Area Studies. One course. *McKean*

171S. Race, Class, and Colonialism in Southern Africa. Domination and opposition in the countries of southern Africa; political consequences of differing forms of colonialism, white settlement, nationalism, and industrialization. C-L: Comparative Area Studies. One course. *Johns*

172. Political Economy of Global Natural Resources. Analysis of mineral and energy policies of selected countries. Focus upon relationships between producer and consumer countries, transnational corporations, and international cartels. C-L: Comparative Area Studies. One course. *Johns*

173S. Political Economy of World Food Problems. Changing policies toward food production and distribution. Topics include American agricultural policy, international food and famine aid, and Third World agricultural development strategies. C-L: Comparative Area Studies. One course. *Johns*

175. Political Parties and Legislatures in Western Democracies. The origin, maintenance, and functions of party and legislative systems in Western democratic societies. C-L: Canadian Studies. One course. *Kornberg*

177, 178. Contemporary Social and Political Development in the Islamic World. An analysis of contemporary events in Iran, Afghanistan, Pakistan, Iraq, and the Arabian Peninsula; the political manifestation on Shi'ia and Sunni Islam; the role of imams and ayatollahs in the politics of Muslim countries; considerations of security in the Arab world and its relationship to global power politics. C-L: Comparative Area Studies. Two courses. *Braibanti*

184. An Introduction to Canada and Canadian Issues. C-L: Interdisciplinary Course 184. One course. *Leach*

186. Political Leadership. The development, characteristics, and impact of political leaders. Biographical and collective studies are considered primarily from a psychological perspective. One course. *Barber*

187. Politics and the Libido. Effects of the libido on elite and mass political activities. Government regulation of sex-inspired behavior. One course. *Paletz*

188. The Psychology of Political Symbols. The role of symbolic political issues in determining public attitudes and voting behavior. Symbolic political issues such as "law and order," pornography, and prohibition; distinguished from public welfare issues such as employment policies. One course. *McConahay*

189, 190. Internship. Open to enrollment by students engaging in practical or governmental work experience during the summer or a regular semester. To enroll, a student must obtain the approval of the Director of Undergraduate Studies, arrange employment, and secure the agreement of a faculty member in the department to supervise a program of study related to the work experience. Two courses. *Paletz*

191, 192. Independent Study. Directed reading and research. Open only to qualified juniors by consent of the Director of Undergraduate Studies and of the supervising instructor. Two courses. *Staff*

193, 194. Independent Study. Directed reading and research. Open only to seniors by consent of the Director of Undergraduate Studies and of the supervising instructor. Two courses. *Staff*

195. Comparative Political Behavior in the United States and Canada. Similarities and differences in political environments and their impact on political institutions and processes. One course. *Kornberg*

196. American University Semester. The Washington Semester Program for study at American University. Four courses: Washington Semester Seminar I; Washington Semester Seminar II; Washington Semester Seminar III; and Washington Semester Internship.

197S-198S. Senior Honors Thesis. Preparation and writing of research paper; group meetings to present topics and for discussion. Open only to senior political science majors in the honors program. See section on honors under description of the major. Two courses. *Staff*

200S. Senior Seminars. One course each. *Staff*

A. American Government and Politics

B. Comparative Government and Politics

C. Political Theory

D. International Relations

For Seniors and Graduates*

201S. Problems in International Security. Major security issues. Prerequisite: a course in international relations or American foreign policy. One course. *Kruzel*

203. Politics and the Media of Mass Communication. Analysis of crucial aspects of the media-politics relationship. Media's effects on political socialization, public opinion, political participation, pluralism, power, and authority. Government's impact on the media. Prerequisite: consent of instructor. One course. *Paletz*

204S. Ethics in Political Life. Ethical issues arising in the conduct of political vocations and activities. C-L: Public Policy Studies 204S. One course. *Spragens*

205S. Science, Politics, and Government. C-L: Psychology 261S, Public Policy Studies 255S, and Sociology 261S. One course. *Staff*

207. American Constitutional Interpretation. Development of the Constitution of the United States through Supreme Court decisions. One course. *Fish*

208S. Analyzing the News. C-L: Public Policy Studies 240S. One course. *Entman*

209. Problems in State Government and Politics. One course. *Leach*

211S. Current Problems and Issues in Japanese Politics. Sources of strength and weakness in the Japanese economy, the rise of new issues and strains in postindustrial society, changes in the party system and decision-making process, the possible transfer of power, the challenge of Japan's new world role. C-L: Comparative Area Studies. One course. *McKean*

*The following courses may be taken by juniors who have earned a 3.0 average and who have obtained the consent of the instructor and Director of Graduate Studies.

213S. Theories of International Political Economy. Comparison and assessment of traditional and modern theories in terms of their logical and empirical validity. One course. *Grieco*

214S. The Politics of Scarcity. Issues in politics, economics, ethics, and policy associated with conflicts arising from long-term scarcity in crucial resources. One course. *McKean*

218S, 219S. Political Thought in the United States. 218S: The Founders and their European and Puritan antecedents; debates over slavery and the Union. 219S: topics in late nineteenth- and twentieth-century thought. Two courses. *Price*

220S. Problems in International Politics. Prerequisite: one course on international relations, foreign policy, or diplomatic history. C-L: Comparative Area Studies. One course. *Holsti or Hough*

223. Political Philosophy from Plato to Machiavelli. Intensive analysis of the political philosophies of Plato and Aristotle, a survey of medieval political thought, and an analysis of the significance of Machiavelli. One course. *Staff*

224. Modern Political Theory. A historical survey and philosophical analysis of political theory from the beginning of the seventeenth to the middle of the nineteenth century. The rise of liberalism, the Age of Enlightenment, the romantic and conservative reaction, idealism, and utilitarianism. One course. *Spragens*

225. Comparative Government and Politics: Western Europe. Rise of modern political parties; extension of the suffrage; entry of bourgeoisie, peasants, and workers into politics; center-periphery conflicts; emergence of the welfare state and of planned economies; problems of "collectivist" politics. One course. *Lange*

226S. Theories of International Relations. An overview with applications to political-military and political-economic empirical problems. C-L: Comparative Area Studies. One course. *Grieco*

227. International Law. Elements of international law, particularly as interpreted and applied by the United States; rights and duties of states with respect to recognition, state territory and jurisdiction, nationality, diplomatic and consular relations, treaties, treatment of aliens, pacific settlement of disputes, international regulation of the use of force, and collective responsibility. C-L: Canadian Studies and Comparative Area Studies. One course. *Pye*

229. Recent and Contemporary Political Theory. The rise of positivism and its impact upon modern political thought, the origins of socialism, Marxism and its variants, socialism in the Soviet Union, nationalism, fascism and national socialism, the crisis in modern democracy, Christianity, and social order. One course. *Staff*

233S. Quantitative Political Analysis II. Intermediate statistical methods, especially linear regression, for political science research. Emphasis on assumptions and interpretations of results. Prerequisite: Political Science 138 or 236 or equivalent. One course. *Hoadley*

234S. Political Economy of Development: Theories of Change in the Third World. Alternative approaches to political, economic, and social change in Latin America, Africa, and Asia. C-L: Anthropology 234S, History 234S, Interdisciplinary Course 234S, and Sociology 234S. One course. *Bergquist, Gereffi, Smith, and Valenzuela*

235S. Comparative Development of Islam. Comparative development of Islam in Indonesia, Malaysia, Pakistan, India, North Africa, and sub-Saharan

Africa. A comparative analysis of the resurgence of Islam as a religious, political, and cultural force. C-L: Comparative Area Studies. One course. *Braibanti*

236. Statistical Analysis. Introduction to statistics in political research, emphasizing research design, descriptive and inferential statistics, and use of computers. Not open to students who have had or are enrolled in Political Science 138, Economics 138, Mathematics 53 or 117, Psychology 117, Public Policy Studies 112 or 122, or Sociology 132 or 293. One course. *Hoadley*

242S. Comparative Law and Policy: Ethnic Group Relations. C-L: Public Policy Studies 242S. One course. *Horowitz*

245. Ethics and Policy Making. C-L: Public Policy Studies 223. One course. *Price*

248. The Politics of the Policy Process. C-L: Public Policy Studies 219. One course. *Staff*

249. Comparative International Development and Technology Flow. Analysis of social, political, and economic development in Third World countries. The internal problem of maintaining political systems and the external problem of adapting intermediate or appropriate technologies. C-L: Comparative Area Studies. One course. *Braibanti*

253. Comparative Government and the Study of Latin America. Current literature on major themes of Latin American politics. C-L: Comparative Area Studies. One course. *Valenzuela*

260. The Tradition of Political Inquiry. Past and present problems, goals, presuppositions, and methods. One course. *Spragens*

262S. International Communism. One course. *Hough*

275. The American Party System. An intensive examination of selected facets of American national political parties, such as relationships between presidential and congressional politics, the politics of national conventions, recent foreign policy and party alignments, and the controversy over party government. One course. *Kornberg*

277. Comparative Party Politics. The impact of social and political systems on party structures, functions, ideologies, and leadership recruitment. Emphasis upon research techniques and objectives. One course. *Kornberg*

280S. Comparative Government and Politics: Sub-Saharan Africa. Politics and government in selected African states, with particular attention to the problems of decolonization and modernization in the postindependence period. Prerequisite: Political Science 161 or consent of instructor. C-L: Comparative Area Studies. One course. *Johns*

282S. Canada. C-L: Interdisciplinary Course 282S. One course. *Leach and visitors*

283S. Congressional Policy Making. Lawmaking and oversight of the executive branch by the U.S. Congress. Committee, party, executive, and interest group roles. C-L: Public Policy Studies 283S. One course. *Price*

286S. Judicial Administration. Organization, case processing, and management of courts with emphasis on federal appellate courts. Prerequisite: Political Science 127. One course. *Fish*

293. Federalism. Theoretical and operational aspects of federal systems of government, focusing on the United States and Canada. C-L: Canadian Studies. One course. *Leach*

COURSES CURRENTLY UNSCHEDULED

- 106. International Security
- 125. American Political Parties and Practical Politics
- 139. Bureaucracy and Public Policy
- 152. Authoritarianism and Revolution in Latin America
- 158. Foreign Policy Decision Making in the United States
- 162. Comparative Government and Politics: Communist and Socialist Political Systems
- 174. Political Biography
- 217S. Economic Theories of Political Behavior
- 239S. Current Problems of International Law
- 244S. Administrative Law and Process
- 246. Administration and Public Policy
- 285. The Judicial Process

POLITICAL INTERNSHIPS

The department administers an internship program, primarily in Washington, DC, for political science majors and interested nonmajors. Students participate by qualifying for a position obtained by the department or by acquiring their own relevant employment, with or without compensation. They also attend weekly sessions with guest speakers in Washington during the summer. Course credit can be obtained by enrolling in Political Science 189 or 190 and writing an analytical paper. Potential applicants should contact the Internship Director, Louise Walker, (327 Perkins) at any time, but preferably in the fall semester.

POLITICAL SCIENCE COURSES BY FIELDS

Political science courses for undergraduates are offered in four fields, as noted below; students majoring in the department must complete at least one course in each of three fields.

American Government, Politics, and Public Administration. Political Science 91, 91D, 100, 108, 109, 112S, 118, 125, 127, 128, 129, 137, 139, 140, 141, 145, 146, 154, 164, 174, 186, 187, 188, 189, 190, 191,* 192,* 193,* 194,* 196, 197S–198S,* 200S A, 203, 205S, 207, 208S, 209, 244S, 246, 248, 275, 283S, 285, 286S.

Comparative Government and Politics. Political Science 92, 107, 111, 136, 151, 152, 153, 161, 162, 163, 165, 169, 171S, 172, 173S, 175, 177, 178, 184, 191,* 192,* 193,* 194,* 195, 197S–198S,* 200S B, 211S, 214S, 217S, 225, 234S, 235S, 242S, 249, 253, 262S, 277, 280S, 282S, 293.

Political Theory and Methodology. Political Science 94, 123, 126, 131, 138, 144S, 191,* 192,* 193,* 194,* 197S–198S,* 200S C, 204S, 218S, 219S, 223, 224, 229, 233S, 236, 245, 260.

International Law, Relations, and Politics. Political Science 93, 93D, 106, 113, 114, 120, 121, 122, 149, 157, 158, 160, 166, 191,* 192,* 193,* 194,* 197S–198S,* 200S D, 201S, 213S, 220S, 226, 227, 239S

THE MAJOR

Requirements. Eight courses in political science including (1) at least one course in each of three fields; (2) at least two courses at the 200 level; and (3) no more than three cross-listed courses originated outside the Department of Political Science. (Such cross-listed courses appear in the preceding listing without descriptions.)

Suggested Work in Related Disciplines. Several courses in such disciplines as anthropology, economics, history, philosophy, psychology, public policy, religion, and sociology are desirable.

*If subject matter is appropriate to the field.

Honors. The department offers students majoring in political science a senior honors program, by successful completion of which a participant achieves graduation with distinction in political science. The central feature and requirement of the program is the honors thesis which the student prepares under faculty supervision. Students who have attained at least a 3.0 grade average overall and a 3.3 average in political science courses may enter the program by submitting a research proposal to the departmental honors committee and also obtaining consent of a faculty member to supervise the proposed thesis prior to the end of the second semester of the junior year. In the first semester of the senior year, accepted students take Political Science 197S with emphasis on research methods. The following semester they take Political Science 198S during which their thesis is written, presented orally, and evaluated by the honors committee. Graduation with distinction is awarded to students receiving a grade of A—or better. Further information may be obtained from the chairman of the honors committee or the Director of Undergraduate Studies.

Psychology (PSY)

Professor Carson, *Chairman*; Professor Guttman, *Director of Undergraduate Studies*; Professors Alexander, Bevan, Borstelmann, Costanzo, Diamond, C. Erickson, R. Erickson, Kimble, Martin Lakin, Lockhead, H. Schiffman, Staddon, M. Wallach, and Wing; Associate Professors Casseday, Coie, Day, Eckerman, W. C. Hall, W. G. Hall, McConahay, Roth, and Rubin; Assistant Professors Butzin and Kremen; Associate Professor Emeritus Banham; Adjunct Professors Brodie, Campbell, and Crovitz; Lecturers Ackerman, Barnes, Clark, Cofer, Cooper, B. Erickson, Herman, Hilkey, Hinson, Keefe, King, Musia Lakin, Lochman, Logue, Marsh, Page, Payne, Pinkerton, Pitts, Sawyer, S. Schiffman, Shipley, Somjen, Surwit, Thompson, L. Wallach, Williams, and Wolbarsht

Students taking their first course in psychology are expected to participate as subjects in three to six hours of psychological research. This requirement must be met even though a student has received advanced placement.

11. Introductory Psychology. Biological bases of behavior, psychological development, cognitive psychology, personality, abnormal behavior, and social psychology. One course. *Staff*

101. Learning and Adaptive Behavior. Principles of instrumental learning in animals and humans. Prerequisite: none, but some knowledge of quantitative science is desirable. One course. *Staddon*

102. Sensation and Perception. Principles of organization of perceptual systems, including sensory systems (vision, audition, proprioception, and chemical senses); pattern recognition; perceptual anomalies; attention; methods of measurement. Prerequisite: Psychology 11. One course. *R. Erickson or Lockhead*

103. Biological Basis of Behavior. Behavior as a product of evolution and the role of behavior in species survival. Neural and endocrine factors in reproduction, hunger, thirst, emotion, and intelligence. Heredity and environment in the development of behavior. Prerequisite: none, but an introductory course in psychology or biology is desirable. One course. *C. Erickson or W. G. Hall*

104. Personality. Representative theories of personality from Freud to the present, emphasizing problems of normal personality structure, dynamics, development, and assessment. Prerequisite: Psychology 11. One course. *Alexander, Carson, Kremen, Martin Lakin, or H. Schiffman*

105. Developmental Psychology. Theory and research on growth and behavior from infancy to adolescence. Prerequisite: Psychology 11. One course. *Borstelmann, Butzin, or Eckerman*

- 106. Social Psychology.** Problems, concepts, and methods in the study of social interaction and interpersonal influence. Prerequisite: Psychology 11. C-L: Sociology 106. One course. *Costanzo or George*
- 107. Cognitive Psychology.** Cognition, including pattern recognition, concept formation, attention, memory, imagery, language, problem solving, and thinking. Emphasis is both empirical and theoretical. Prerequisite: Psychology 11. One course. *Day*
- 109. Abnormal Psychology.** Disordered behavior and constructive personality change viewed in interpersonal and social context for purposes of understanding normal and abnormal personality development and functioning. Prerequisite: Psychology 11. One course. *Carson or H. Schiffman*
- 110. Applied Psychology.** Applications of psychology to problems of personnel selection, industrial efficiency, advertising, and selling. Prerequisites: Psychology 11 and 117. One course. *Wing*
- 117. Statistical Methods in Psychology.** Elementary statistical techniques and their application to the analysis and interpretation of psychological data. Theory of inference is stressed. Psychology majors only. Not open to students who have had Economics 138 or Mathematics 53 or 117. One course. *Staff*
- 118. The Psychology of Individual Differences.** Nature and causes of individual and group variations in intelligence, special abilities, social and emotional characteristics. Prerequisites: Psychology 11 and 117. One course. *Wing*
- 122S. Child Observation.** Observation of children in the group setting of the University Preschool and Primary Program. Aspects of personality, social development, and child-adult relationships. Open only to junior and senior psychology majors with consent of instructor. One course. *Musia Lakin*
- 126. Behavior and Neurochemistry.** The role of brain chemicals (transmitters, peptides, and hormones) in behavior. Hypotheses addressing the neurobiology of mental disorders. Prerequisite: Psychology 103. One course. *Cooper*
- 129. Survey of the History of Psychology.** Landmarks in systematic psychology from early Greek science to the present. Prerequisite: two courses in psychology; a course in history of science, philosophy, or physics is desirable. One course. *Guttman*
- 130. Perspectives on Human Development.** C-L: Interdisciplinary Course 180 and Sociology 169. One course. *Martin Lakin and Maddox*
- 134. Psychology of Language.** Psychological "reality" of linguistic structures, language and cognition, biological bases, animal communication, language pathologies, nonverbal communication, language vs. music, linguistic universals, and bilingualism. Everyday language phenomena (e.g., slips of the tongue) as well as the experimental and theoretical literature. Prerequisite: Psychology 11; Psychology 107 is desirable. C-L: Linguistics. One course. *Day*
- 135. Hormones and Behavior.** The endocrine system and hormones in maternal, sexual, and emotional behavior. Prerequisite: Psychology 103. One course. *Staff*
- 136. Advanced Developmental Psychology.** Issues, concepts, and methods in psychological development, e.g., comparative social development, social cognition, adolescence. Prerequisite: Psychology 105 or consent of instructor. One course. *Borstelmann, Butzin, or Eckerman*
- 139. Motivation.** Contemporary use of such concepts as instinct, drive, and expectancy in the explanation of behavior; the role of nervous mechanisms and

hormones in the control of goal-directed behavior. Prerequisite: Psychology 11 or 102 or 103. One course. *Guttman or W. G. Hall*

Note: Laboratory courses (140S through 148S) are open chiefly to juniors and seniors. The subject matter varies, but the courses have in common a concern with the design and execution of psychological experiments. Students will find them helpful as a means of gaining experience before engaging in independent study.

140S. Research Methods in Child Psychology. Prerequisite: Psychology 105. One course. *Butzin, Eckerman, or L. Wallach*

141S. Tests and Measurements. Test methods used by psychologists to measure and evaluate mental processes. Prerequisites: Psychology 11 and 117 or equivalents. One course. *Wing*

143S. Experimental Methods in Cognitive Psychology. Human cognition; language, memory, problem solving, and other higher mental processes. Prerequisite: Psychology 107. One course. *Rubin*

145S. Experimental Approaches to Personality. Methods applied to personality research. Prerequisite: Psychology 104. One course. *M. Wallach or Wing*

146S. Experimental Comparative Psychology. Animal behavior from evolutionary and physiological viewpoints. Emphasis on methodology. Prerequisite: Psychology 102 or 103. One course. *Staff*

147S. Experimental Social Psychology. Group dynamics, attitude change, and interpersonal perception. Prerequisite: Psychology 106. One course. *Staff*

148S. Psychology of Perception and Thinking. Basic phenomena of perception and thinking as determined by conditions in the external situation and in the person: biological and psychological. Prerequisite: Psychology 102. One course. *Lockhead*

151S-152S. Child Clinical Psychology. Theories of clinical intervention with children and families; research on prediction of adult disorders from childhood problems, evaluation of therapy and epidemiological data. Practicum with children in schools, coupled with in-class training. Prerequisites: Psychology 105 and 109. 151S: fall semester, one course. 152S: spring semester, half course, pass/fail. *Coie*

153S. Child Rearing: Theories, Research, Realities. Analysis of issues, concepts, and studies on determinants of general trends and individual variations in the care and training of children from infancy to adolescence. Prerequisite: Psychology 105; Psychology 117 and 140 are recommended. One course. *Borstelmann*

154S. Education, Children, and Poverty. Psychological hypotheses concerning the roles of preschool intervention programs, improved quality of resources, teacher expectancy effects, and enhancement of pupil self-confidence, in relation to the goal of improved cognitive competence for poverty background children. Criteria for defining competence, such as scores on psychometric intelligence tests, performing on Piagetian tasks, and development of specific skills. Interpretations concerning intelligence and cognitive deprivation in poor children in the light of relevant psychological evidence. Prerequisite: one course in psychology or consent of instructor. One course. *M. Wallach*

170S. A-F. Seminar in Selected Problems. One course each. *Staff*

171T, 172T, 173T, 174T. Junior-Senior Tutorials. Small group discussions about influential books and articles in psychology. The availability of tutorials, their content, and the instructors will be announced before registration. Prerequisite:

sites: Psychology 11 or two courses from Psychology 101 through 109 and Psychology 117 or the equivalent and consent of Director of Undergraduate Studies. Pass/fail only. Half course each. *Staff*

181S. Art and Its Making. An inquiry into artistic process from a conceptual survey of dominant views to direct interviewing of and discussion with artists. Prerequisites: junior or senior standing and consent of instructor. C-L: Interdisciplinary Course 181S. One course. *Kremen*

191, 192. Independent Study. Directed reading and research. Prerequisite: consent of instructor and Director of Undergraduate Studies. Two courses. *Staff*

193, 194. Independent Study. Directed reading and research. Limited to seniors. Two courses. *Staff*

199S. Great Books in Biology: Evolution, Genetics, Neurobiology. Analysis of original texts by great pioneers in biology—Darwin, Mendel, Galton, Claude Bernard, Sherrington, and others. Prerequisite: junior standing. C-L: Distinguished Professor Course 199S. One course. *Diamond*

For Seniors and Graduates

Courses at the 200 level are open to selected undergraduates only with written consent of the instructor.

202S. Great Ideas in Psychology. A broad range of great ideas in psychology drawn from various content areas, methodological approaches, and time frames. Prerequisite: senior standing. One course. *Day*

203S. Sensation and Perception. Classical and current concepts and methods. One course. *Lockhead*

210S. Cognitive Psychology. Theoretical and experimental approaches to understanding cognitive processes such as attention, memory, language, problem solving, and thinking. One course. *Day, Lockhead, or Rubin*

212S. Human Memory. Literature, classical and modern; data and theories relating to mechanisms of information processing, storage, and retrieval. One course. *Rubin*

214S. Development of Social Interaction. Major developments of children's interactions with others (e.g., attachment, social play, aggression, sex typing, and moral reasoning). Ethological, learning, personality, and cognitive-developmental viewpoints. One course. *Eckerman*

215S. Cognitive Development. Major concepts of the development of knowledge in children with particular attention to Piaget. Consideration of educational implications. One course. *L. Wallach*

216S. Biological Psychology. The neural basis of behavior with special emphasis on the organization and evolution of the neocortex and the dorsal thalamus. A historical approach, using original texts by LeGros Clark, Elliot Smith, Herrick, Sherrington, Cajal, Campbell, and many others. While emphasis is on the neocortical sensory systems, the structure and function of the limbic system and hypothalamus are reviewed. C-L: Anatomy 216S. One course. *Diamond*

217S. Social Psychology. Social factors in cognition, models of social interaction, conformity and social influence, and attitude development and change. One course. *Costanzo*

219S. Neural Bases of Behavior. Structure and function of the nervous system as related to problems of sensory-motor processes, learning, motivation, and memory. One course. *C. Erickson and R. Erickson*

230S. Social Behavior of Animals. Developmental, ecological, and physiological aspects of territorial, sexual, parental, and aggressive behavior. One course. *C. Erickson*

234S. Personality. Selected topics of current interest concerning empirical research on personality. Strategies for the definition of research questions and the evaluation of research progress. One course. *M. Wallach*

238S. Electroencephalogram and Psychological Function. A survey of experimental and clinical literature on brain wave correlates of intelligence, personality, behavior disorders, epilepsy, sleep, sensory stimulation, reaction time, and attention. Emphasis on the electrophysiology of conditioning and learning. Lectures, laboratory demonstrations, and clinical case presentations. One course. *Marsh*

245S. Personality Theory. Representative theories of human functioning, from Freud to contemporary approaches. One course. *Kremen or staff*

260S. Science, Technology, and Society. C-L: Sociology 260S. One course. *Bevan and McKinney*

261S. Science, Politics, and Government. The structure and values of the scientific community, the mechanism and strategies of government, and their mutual interdependence in American society. C-L: Political Science 205S, Public Policy Studies 255S, and Sociology 261S. One course. *Bevan and McKinney*

271S. A-F. Selected Problems. One course each. *Staff*

272S. Physiology of the Central Nervous System. Prerequisites: Physiology 200 or equivalent and Physiology 270 or equivalent and knowledge of neuroanatomy; for undergraduates, consent of instructor. C-L: Physiology 272S. Half or one course. *Somjen and staff*

273S, 274S. Statistical Principles in Experimental Design. The problems of scientific inference; methods of data analysis and issues in experimental design. Two courses. *Roth*

283S, 284S. The History of Psychology. 283S: Aristotle to Kant. 284S: development of modern psychology. Prerequisite for 284S: Psychology 283S or consent of instructor. Two courses. *Guttman*

286S. Psychophysiology of Hearing. Relation of anatomy and physiology to psychophysics of the auditory system. Prerequisite: consent of instructor. One course. *Casseday*

295S. Group Psychotherapy and Processes. Past and current trends in group intervention techniques. Field observations. One course. *Martin Lakin*

COURSES CURRENTLY UNSCHEDULED

137. Physiological Basis of Perception

144S. Learning and Adaptive Behavior

253S. Psychological Approaches to Public Policy Analysis

THE MAJOR

Psychology Courses by Fields and Levels. For the purpose of defining the requirements for the Bachelor of Arts and Bachelor of Science degrees, certain psychology courses are grouped by content areas (A and B) and also by lower and upper levels (1 and 2). These groups are constituted as follows:

A-1: 101, 102, 103, 107

B-1: 104, 105, 106, 109

A-2: 110, 118, 126, 134, 135, 137, 139, 141S, 143S, 144S, 146S, 148S, 202S, 203S, 210S, 212S, 216S, 219S, 230S, 238S, 272S, 286S

B-2: 122S, 130S, 136, 140S, 145S, 147S, 151S-152S, 153S, 154S, 215S, 217S, 234S, 245S, 295S

All courses numbered above 109 are upper level courses and all may be used to fulfill the requirements (see below) for a third upper level course.

For the A.B. Degree

Eight courses in psychology, including 117; one course from each of the groups A-1, B-1, A-2, B-2; three additional courses of the student's selection, one of which must be upper level (above 109). Mathematics 53 or 117 or Economics 138 may be substituted for Psychology 117 but does not count as one of the eight required psychology courses. Note that although Psychology 11 is not required for the major, it is a prerequisite for certain courses and it counts toward the eight-course major requirement.

For the B.S. Degree

The Bachelor of Science degree program consists of the above requirements plus two calculus courses and six natural science or 100-level mathematics courses.

Independent Study

A program of individualized readings or an empirical research project may be carried out by arrangement with a faculty supervisor and enrollment in Psychology 191-194. A written plan of the program must be approved by the supervisor and the Director of Undergraduate Studies. Credit for 191-194 may be recorded either as pass/fail or by means of letter grades.

Honors

Any student majoring in psychology with an overall grade point average of 3.0 and a grade point average of 3.3 in psychology courses may be a candidate for graduation with distinction in psychology. Recommendation for this honor is made by a faculty committee which evaluates a thesis submitted by the candidate and administers an oral examination. Honors candidates typically enroll in independent study courses during one or more semesters, often as early as the junior year, but enrollment in independent study is not a precondition of candidacy. All eligible students are encouraged to carry out honors work and to secure the sponsorship of a faculty supervisor. See the section on honors in this bulletin.

Public Policy Studies (PPS)

Associate Professor Behn, *Chairman*; Assistant Professor Hawes, *Director of Undergraduate Studies*; Bonnie Bain, *Director of Internship Programs and Placement Services*; Professors Barber (political science), Blaydon, Eddy, Horowitz (law), Hough (political science), Lange (law), Pearsall (engineering), Price (political science), and Viscusi (business); Associate Professors Clotfelter, Lipscomb, Magat (business), McConahay, Stack, and Vaupel; Assistant Professors Devaney, Entman, Kuniholm, and Luger; Professors of the Practice Broder, Geller, Kaiser, Stubbing, and Yaggy (Medical Center); Adjunct Professors Bromberg, Jackson, and Owen; Visiting Professor Coles; Lecturers Green, Ho, Harris, Payne, and Shore; Adjunct Lecturer Tait

Courses in public policy are open to all students providing that any prerequisites are met.

55. Analytical Methods for Public Policy Making. Basic concepts of analytical thinking including quantitative methods for assessing the probabilities of outcomes and appraising policy alternatives. Illustrated by problems faced by busy decision makers in government, business, law, medicine, etc. One course. *Lipscomb or Vaupel*

107. Comparative Environmental Policies. C-L: Political Science 107. One course. *McKean*

110. Economic Analysis for Public Policy Making: Microeconomic and Nonprobabilistic Models. Application of microeconomic analysis to public policy areas, including agriculture, housing, taxation, and income redistribution. Prerequisite: Economics 52 or equivalent. One course. *Behn, Cook, or Lipscomb*

112. Policy Evaluation and Experimentation. Uses and limitations of statistical methods, including experimentation, for monitoring and evaluating public policies. Prerequisite: Public Policy Studies 55. One course. *Behn, Devaney, or McConahay*

114. Political Analysis for Public Policy Making. Analysis of the political and organizational processes which influence the formulation and implementation of public policy. Alternative models. C-L: Political Science 145. One course. *Entman or Hawes*

116. Policy Choice as Value Conflict. Theoretical and practical problems in decision making in relation to conflicts of value and of interest. The manifestation of norms deriving from professional ethics, ideology, law, and other sources in such policy issues as welfare, environmental management, and national defense. One course. *Kuniholm or Payne*

151. Administration of Justice. Analysis of policy problems and conflicts involved in the operation of the criminal justice system. One course. *Cook*

152S. Administration of Justice, Summer Internship. Prerequisite: Public Policy Studies 151. One course. *Staff*

154. Communications Policy. Analysis of policy problems and conflicts involved in governmental regulation of the communications media. Prerequisite: consent of instructor. One course. *Staff*

155S. Communications Policy, Summer Internship. Prerequisite: Public Policy Studies 154. One course. *Staff*

157. Health Policy. Analysis of health care problems and policies. One course. *Hawes or Lipscomb*

158S. Health Policy, Summer Internship. Prerequisite: Public Policy Studies 157. One course. *Staff*

159. State and Local Public Policy. Causes of and alternative solutions to the problems of state and local governments, with emphasis on North Carolina. One course. *Luger*

161S. State and Local Public Policy, Summer Internship. Prerequisite: Public Policy Studies 159. One course. *Staff*

166. Child Policy in the United States. Social, economic, and political dimensions of policies affecting children in America. One course. *Stack*

174. Technology Assessment and Social Choice. C-L: Engineering 174 and Religion 174. One course. *Garg and McCollough*

175S. The Palestine Problem and United States Public Policy. Identification of Arab and Zionist perceptions, alternatives available to American decision

makers, interest group pressures on United States policies, historical analysis as a means to improve public policy. C-L: Comparative Area Studies and History 159S. One course. *Kuniholm*

176S. American Communities: A Photographic Approach. A documentary approach to the study of American communities through individual photographic projects centered around a community of the student's choosing. Prerequisite: consent of instructor. C-L: Film. One course. *Harris*

178. Visual Language and Policy Choice. History and significance of the documentary tradition, the differences between visual and verbal social observation and the ways photography can alter the analysis of social and policy problems. C-L: Film. One course. *Coles and Harris*

180S. Writing for the Media. Workshop on writing news stories, editorials, and features for the print media. Prerequisite: consent of instructor. One course. *Green*

182S. Production of Television News and Documentaries. Students will research, write, and produce videotapes dealing with public problems and policy alternatives. C-L: Film. One course. *Staff*

185. American Diplomacy from the Kennedy Administration to the Present. C-L: History 185. One course. *Davis or Kuniholm*

186S. Shaping the News. The content of news about politics and public policy in newspaper, magazine, and broadcast journalism. Examines how the best in social journalism is produced. C-L: Political Science 112S. One course. *Barber*

190. Internship. For students working in a public agency, political campaign, or other policy-oriented group under the supervision of a faculty member. Prerequisites: prior consent of Director of Internship Programs and Director of Undergraduate Studies. One course. *Staff*

191, 192. Independent Study. Directed reading and research. Up to two courses. *Staff*

193, 194. Independent Study. Directed reading and research for seniors. Up to two courses. *Staff*

195S. Selected Public Policy Topics. One course. *Staff*

For Seniors and Graduates

204S. Ethics in Political Life. C-L: Political Science 204S. One course. *Spragens*

207S. Mass Media, Public Opinion, and Public Policy. Reciprocal impacts of the journalistic process and the policy process. Topics include: influence of elites on media content; effect of media messages on the ordinary citizen's perception and evaluation of policy issues; impact of the content and form of media coverage on the options, actions, and frustrations of policy makers. One course. *Entman*

215S. Public Policies to Save Lives. Economic, political, legal, and ethical issues in governmental efforts to reduce mortality through various health and safety programs and regulations. One course. *Vaupel*

217. Microeconomics and Public Policy Making. Consumption and production theory, welfare economics, theories of collective choice, market structures and regulation, and nonmarket decision making. One course. *Clotfelter*

218. Macroeconomic Policy. Survey of macroeconomic theory and analysis of policies designed to reduce unemployment, stimulate economic growth, and

stabilize prices. Conventional monetary and fiscal instruments, employment policies, and new policies designed to combat inflation. One course. *Luger*

219. The Politics of the Policy Process. The formulation of public policies, substantive policies in a variety of contexts from local government to international affairs; the role of legislatures, interest groups, chief executives, and the bureaucracy in defining alternatives and in shaping policy from agenda formulation to implementation. C-L: Political Science 248. Not open to students who have taken Public Policy Studies 114. One course. *Hawes*

221. Analytical Methods I: Decision Analysis for Public Policy Makers. Methods for structuring decision dilemmas and decomposing complex problems, assessing the probabilities of uncertain consequences of alternative decisions, appraising the decision maker's preferences for these consequences and for re-examining the decision. Not open to students who have taken Public Policy Studies 55. One course. *Behn*

222. Analytical Methods II: Data Analysis for Public Policy Makers. Sampling theory, Bayesian statistics, and regression analysis. Examples from problems in health care, transportation, crime, urban affairs, and politics. Not open to students who have taken Public Policy Studies 112. One course. *Staff*

223. Ethics and Policy Making. Normative concepts in politics, liberty, justice, and the public interest. Historical and philosophical roots, relationship to one another and to American political tradition, and implications for domestic policy problems. C-L: Political Science 245. One course. *Price*

231. Analytical Methods III: Quantitative Policy Evaluation. Problems in quantifying policy target variables such as unemployment, crime, and poverty. Experimental and nonexperimental methods for evaluating the effect of public programs, including topics in experimental design, regression analysis, and simulation. Prerequisite: Public Policy Studies 222 or equivalent. One course. *Staff*

232. Analytical Methods IV: Topics in Economic Policy. Cost benefit analysis of public programs. Public utility regulation, pollution regulation, hospital rate setting, regulation of product safety. Quantitative methods and microeconomic theory for analysis of both normative and positive aspects of economic policy. Prerequisites: Public Policy Studies 110 or 217 or Economics 149 and familiarity with regression analysis or concurrent enrollment in Public Policy Studies 231. One course. *Staff*

236S, 237S. Public Budgeting and Management I and II. 236S: evaluative techniques for improving budget decisions; administrative concepts for managing public agencies. 237S: emphasis on corporate strategy, leadership and motivation, organizational structure, and cut-back management. Prerequisite for 237S: Public Policy Studies 236S. Two courses. *Staff*

240S. Analyzing the News. Research seminar on political messages and effects of media. Methodologies and findings of content analysis, survey research, critical theory, semiology; research project integrating these approaches. C-L: Political Science 208S. One course. *Entman*

241. Reporting the American People. Critical analysis of the sources of information the media rely upon in reporting opinion and policy preferences: opinion polls, bellwethers, informed elites. Includes the design and execution of a public opinion poll on a topic of local or national interest. One course. *McConahay*

242S. Comparative Law and Policy: Ethnic Group Relations. Various approaches to the reduction of conflict in deeply divided societies, primarily in

Asia and Africa, with secondary attention to Western countries. The nature of ethnic identity, the sources of group conflict, and the forms and patterns it takes. Methods of analyzing social science materials and utilizing them for the design of policies, laws, and institutions. C-L: Political Science 242S. One course. *Horowitz*

250. Public Policy and the Arts. Democratic and aesthetic values in respect to past and present patterns of public support for the arts; for example, subsidies, tax policy, censorship, and the effect of public choices on standards of quality. Visual and performing artists and policy makers from government and business will participate. One course. *Payne*

255S. Science, Politics, and Government. C-L: Political Science 205S, Psychology 261S, and Sociology 261S. One course. *McKinney and Phillips*

257. United States Policy in the Middle East. From World War II to the present with a focus on current policy options. C-L: Comparative Area Studies. One course. *Kuniholm*

264S. Research Seminar: Topics in Public Policy I. Selected topics. One course. *Staff*

268. Federal Tax Policy. Structure, incidence, and economic effects of major federal taxes. Special attention to problems of inflation, income definition, distortions, savings, and investment. One course. *Clotfelter*

270S. Humanistic Perspectives on Public Policy. Modes of inquiry into aspects of social life important to policy makers but beyond the normal reach of social science. Reading from James Agee, Robert Coles, Eudora Welty, James Baldwin, George Eliot, and others. Prerequisite: consent of instructor. One course. *Coles and Payne*

272. Resource Economics and Policy. C-L: Forestry and Environmental Studies 270. One course. *Hyde*

283S. Congressional Policy Making. C-L: Political Science 283S. One course. *Price*

COURSES CURRENTLY UNSCHEDULED

153. Criminal Justice Policy and Minorities

160S. Energy Technologies and Their Social Impact

162. Anthropological Perspectives on Public Policy

206S. Contemporary Social Journalism

224. Applications of Administrative and Organizational Theory

252S. National Security Policy

253S. Psychological Approaches to Public Policy

254. Transportation Planning and Policy Analysis

256. The Economics of Health Care

260S. Research Seminar: The Administration of Justice

261S. Research Seminar: Health Policy

262S. Communication Policy and the Law

266. The Politics of Health Finance and Regulation

273S. The Uses of History in Public Policy II

276S. National Policies and the Family

INTERNSHIP COURSES

The internship courses provide students with an opportunity to develop a basic understanding of one or more public policy areas, to apply that understanding in a job during the summer, and to return to the classroom to build on this knowledge and experience. Normally, students take a two-course sequence to receive credit for the field experience requirement of all public policy studies majors. Prior to participation in the internship program, all majors must have completed Public Policy Studies 55 and three of the four core courses (Public Policy Studies 110, 112, 114, or 116). This requirement may be waived by the Director of Undergraduate Studies for transfer students or others in unusual circumstances. Applications for enrollment in the internship program must be completed in the early fall through the Director of Internship Programs. Stipends are usually provided for all public policy majors enrolled in one of the following internship courses: Public Policy Studies 152S, 155S, 158S, or 161S.

All majors are encouraged to take an advanced follow-up course in the area of their summer internship.

THE MAJOR

The policy studies major is an interdisciplinary social science program designed to provide students with the skills, analytical perspectives, and descriptive information which policy analysts need to deal effectively with major contemporary social problems. The course of study familiarizes the student with the kind of contribution each of several disciplines (political science, economics, social psychology, applied mathematics, history, and ethics) can make to policy analysis. Opportunities are provided, both in the classroom and through field experiences, for students to integrate this material and apply it to analyzing specific public policy issues.

Students majoring in public policy are able to participate in a variety of learning experiences including seminars, lecture and discussion classes, individual study, policy workshops, and an internship. In addition, students are urged to participate actively in programs sponsored by the Institute of Policy Sciences and Public Affairs to supplement material covered in class. As a matter of policy, students are asked to evaluate teaching and course content and are provided both formal and informal opportunities to shape the program and curriculum.

Prerequisites. Economics 2 or 52, Political Science 91, and Public Policy Studies 55.

Major Requirements. Public Policy Studies 110, 112, 114, 116, plus three additional courses, one of which must be a 200-level course. A policy-oriented field experience approved by the Director of Undergraduate Studies is required. (See Internship Courses above.)

Religion (REL)

Associate Professor Bland, *Chairman*; Professor Kort, *Director of Undergraduate Studies*; Professors Bradley, Clark, Jones, Lawrence, Lincoln, Long, Osborn, E. Meyers, Poteat, Price, and Wintermute; Associate Professors Charlesworth, Corless, McCollough, and Partin; Assistant Professor C. Meyers; Lecturer Shows

Study in the Department of Religion arises from and leads to the awareness that an understanding of religion is crucial to an understanding of persons and of human societies. The curriculum develops this understanding in two distinct but inseparable ways: first, through the examination of the particulars of specific religious traditions; and, second, through theoretical studies of an analytic, comparative, and constructive nature.

Introductory courses (Religion 50, 51, 52, 55, 56, 57, 58, and 59) are open to all undergraduates. These courses also help fulfill distributional field requirements

for the religion major. Courses at the 100 level are open to all undergraduates with the exception of specially designated seminars. Courses at the 200 level are open to upperclassmen with the consent of the instructor.

50. The Old Testament. Historical, literary, and theological investigations. C-L: Judaic Studies. One course. *Jones, C. Meyers, E. Meyers, and Wintermute*

51. Introduction to Judaic Civilization. Continuity and change in the major periods of Judaism. C-L: Comparative Area Studies and Judaic Studies. One course. *Bland or E. Meyers*

52. The New Testament. Origins, development, and content of thought. One course. *Charlesworth, Jones, and Price*

52D. The New Testament. Same as Religion 52 with discussion section included. One course. *Staff*

55. The Religion of the Bible. A historical, cultural, and theological study of the Old and New Testaments. Not open to students who have had Religion 50, 50D, 52, or 52D. One course. *Staff*

56. The Black Religious Experience in America. From the slave period to the present. C-L: Afro-American Studies 56. One course. *Lincoln*

57. Introduction to Religions of Asia. Problems and methods in the study of religion, followed by a survey of the historical development, beliefs, practices, and contemporary significance of the Islamic religion and religions of south and east Asia. C-L: Comparative Area Studies. One course. *Bradley, Corless, Lawrence, and Partin*

58. Interpretations of Religion in Western Culture. Western religion as explained by contemporary sociologists, psychologists, anthropologists, and theologians. One course. *Bland and Poteat*

59. An Introduction to Christian Theology and Ethics. Analysis and interpretation of faith and practice. One course. *Kort, McCollough, and Osborn*

60. Ethical Issues in Twentieth-Century America. A critical examination of ethical themes, with special emphasis on public policy. For participants in the Twentieth-Century America Semester only. One course. *McCollough*

71A, 72A. Freshman-Sophomore Seminars: African and Asian Traditions. Topics and instructors to be announced. C-L: Comparative Area Studies. Two courses. *Staff*

99. Perspectives in Archaeology. See Interdisciplinary Course 99. C-L: Anthropology 99 and Classical Studies 99. One course. *Meyers, Younger, and Zagarell*

104. The Prophets of the Old Testament. Their historical setting and message. C-L: Judaic Studies. One course. *Wintermute*

105. Theology of the Old Testament. Emphasis upon history and eschatology, covenant, messianism, and wisdom. C-L: Judaic Studies. One course. *Wintermute*

106. Jesus and the Synoptic Gospels. The gospel tradition in the New Testament. One course. *Charlesworth*

107. Theology of the New Testament. A systematic analysis of the theologies of the New Testament writers and an attempt to synthesize the basic and shared themes. One course. *Charlesworth or Price*

108. The Life and Letters of Paul. Paul's role in the expansion of the Christian movement, the most important aspects of his thought, and his continuing influence. One course. *Price*

109. Women in the Biblical Tradition: Image and Role. C-L: Judaic Studies. One course. *C. Meyers*

110. Archaeology and Art of the Biblical World. The material culture of ancient Palestine as it relates to the Hebrew Bible, the New Testament, and early Judaism. C-L: Judaic Studies. One course. *C. Meyers or E. Meyers*

111. The Historical Jesus. Historical research on the life of Jesus. One course. *Charlesworth or Price*

115-116. Introduction to Biblical Hebrew. (Divinity School courses open to undergraduates with permission of the instructor.) Elements of phonology, morphology, and syntax. Exercises in reading and writing Hebrew. 116: study of the weak verb; exegetical treatment of the Book of Jonah. C-L: Judaic Studies. Two courses. *Bailey*

120. History of the Christian Church. Crucial events, issues, structures, and writings that have shaped the Christian community and influenced Western civilization from the time of the Early Church to the present. One course. *Clark*

124. Christianity in the United States. Leaders and issues in representative movements and institutions. One course. *Jones*

125. Women and Sexuality in the Christian Tradition. A historical survey of Christian attitudes and practices from New Testament times to the present. One course. *Clark*

127. Early Christian Culture: Evidence of Art and Literature. A consideration of major social and political developments from the third to fifth centuries in the Mediterranean basin through the detailed analysis of contemporary monuments and texts. C-L: Art 127 and Classical Studies 127. One course. *Epstein and Gregg*

128. The Background of Contemporary Christian Thought: 1918-1960. Theology of Karl Barth, Rudolf Bultmann, Paul Tillich, Karl Rahner, Reinhold Niebuhr, and others. One course. *Osborn*

131D. Principles of Archaeological Investigation. Supervised field work, visits to other excavations, introduction to ceramic chronology, numismatics, and other related disciplines. Excavation of a late Roman village in Galilee. Offered in Israel, only in the summer. C-L: Judaic Studies. One course. *C. Meyers or E. Meyers*

132D. Palestine in Late Antiquity. The history, literature, and archaeology of Roman Palestine with particular emphasis on Galilee in rabbinic and early Christian times. C-L: Comparative Area Studies and Judaic Studies. One course. *E. Meyers*

133. The Foundations of Post-Biblical Judaism. History, religion, and literature of Pharasaic and sectarian Judaism from the time of Ezra to Rabbi Judah. C-L: Judaic Studies. One course. *E. Meyers*

134. Jewish Mysticism. The main historical stages, personalities, texts, and doctrines from rabbinic to modern times. C-L: Comparative Area Studies, Judaic Studies, and Medieval and Renaissance Studies. One course. *Bland*

135. Jewish Religious Thought. Doctrines, dialectics, and religious attitudes of pre-Enlightenment theologians. C-L: Comparative Area Studies, Judaic Studies, and Medieval and Renaissance Studies. One course. *Bland*

136. Contemporary Jewish Thought. Modern Jewish thought from Mendelssohn to the present, with particular reference to American thinkers. C-L: Judaic Studies. One course. *Bland or E. Meyers*

138. Political Leadership in the Black Church. Turner, Powell, King, Malcolm X, and others. C-L: Afro-American Studies 138. One course. *Lincoln*

139. Modern Hebrew. Representative texts from the modern period, with an introduction to the colloquial language of Israel. C-L: Judaic Studies. One course. *Staff*

140. Religions of India. Major religious traditions of the subcontinent: Hinduism, Buddhism, Jainism, and Islam. C-L: Comparative Area Studies. One course. *Bradley or Lawrence*

141. Religions of China and Japan. Traditional religion in China and Japan and its interaction with Sino-Japanese Buddhism. C-L: Comparative Area Studies. One course. *Corless*

142. Comparative Mythology. Nature and functions of religious myth in Judaism, Christianity, Islam, Hinduism, and Buddhism. C-L: Comparative Area Studies. One course. *Partin*

143. Mysticism. The mystical element of religion: Hinduism, Buddhism, Christianity, and Islam. C-L: Comparative Area Studies. One course. *Bradley*

144. Black Cults and Sects in America. Cult-sect phenomena. C-L: Afro-American Studies 144. One course. *Lincoln*

147. Muhammad and the Qur'an. The Qur'an in relation to the religious experience, life, and work of Muhammad. One course. *Partin*

148. Modern American Religious Cults. Children of God, Unification Church, Scientology, Feraferia, Transcendental Meditation, Krishna Consciousness, Bahai, and others. One course. *Partin*

149. Buddha and Buddhism. A systematic introduction to the origins and spread of Buddhist thought and practice. C-L: Comparative Area Studies. One course. *Corless*

151. Ethical Issues in Social Change and Public Policy. American moral tradition and factors in social change in the normative analysis of public policy, with a consideration of specific ethical issues. One course. *McCollough*

152. Islamic Mysticism. Sufism as an ascetical protest movement that affected the worldwide growth of Islam. C-L: Comparative Area Studies. One course. *Lawrence*

155. Ethical Issues in the Life Cycle. Human development viewed in religious, ethical, and psychological perspectives. One course. *McCollough*

156. Contemporary International Problems: Their Historical Origins and Their Implications for Future Policy. C-L: History 109, Interdisciplinary Course 109, Political Science 160, and Sociology 175. One course. *Staff*

158. Psychology and Religion. Contributions of major psychological theories to an understanding of religion, especially Christianity. One course. *Shows*

160, 161. Introduction to the Civilizations of Southern Asia. C-L: Interdisciplinary Course 101, 102. Two courses. *Lawrence and staff*

162, 163. Introduction to Islamic Civilization. C-L: Interdisciplinary Courses 162, 163. Two courses. *Lawrence or staff*

166. The Professions and Society. Classical and contemporary ethical theories and secular and Judaeo-Christian moral traditions as contexts for considering the responsibilities of professions in contemporary society. Must be taken concurrently with Philosophy 167S. One course. *McCollough and staff*

170. Problems of Religious Thought. Analysis of uses of *know, true, mind, body, time, person, love, meaning*, in modern Western culture as introduction to religious reflection. One course. *Poteat*

172. Religion and Tragedy. Influence of the Judaic-Christian religious tradition on the development of the tragic view of life. One course. *Poteat*

174. Technology Assessment and Social Choice. C-L: Engineering 174 and Public Policy Studies 174. One course. *Garg and McCollough*

188. Recent Literature and Its Religious Implications. Religious elements in recent literature. One course. *Kort*

191, 192. Independent Study. For freshmen and sophomores with departmental approval. Two courses. *Staff*

193, 194. Independent Study. For juniors and seniors with departmental approval. Two courses. *Staff*

195A, 196A. Junior-Senior Seminars: African and Asian Traditions. Topics and instructors to be announced. C-L: Comparative Area Studies. Two courses. *Staff*

195B, 196B. Junior-Senior Seminars: Jewish and Christian Traditions. Topics and instructors to be announced. Two courses. *Staff*

195C, 196C. Junior-Senior Seminars: Analytic, Comparative, and Constructive Studies. Topics and instructors to be announced. C-L: Comparative Area Studies. Two courses. *Staff*

197-198. Honors Research. Consent of the Director of Undergraduate Studies required. Two courses. *Staff*

For Seniors and Graduates

207, 208. Intermediate Biblical Hebrew. Grammar with reading and exegesis of Old Testament prose and poetry. C-L: Old Testament 207, 208 in the Divinity School; and Judaic Studies. Prerequisite: at least one year of Hebrew or consent of instructor. Two courses. *E. Meyers and Wintermute*

212. Policy Making and Theological Ethics. Relation of knowledge, power, and values in policy making; models of decision making in the policy sciences and their ethical implications. One course. *McCollough*

217. Islam in India. History and thought of major Indian Muslims from Biruni to Wali-Ullah, with special attention to the role of Sufism. An introduction to selected Muslim scholars and saints who contributed to the interaction between Islam and Hinduism in Northern India during the second millenium A.D. C-L: Comparative Area Studies. One course. *Lawrence*

218. Religion in Japan. A survey of religion in Japan, with specific emphasis on indigenization and attempts at synthesis. An approach to the meaning of the words *religious* and *secular* in the Japanese situation. One course. *Corless*

220. Rabbinic Hebrew. Interpretive study of late Hebrew, with readings from the Mishnah (Avoth and Avodah Zarah). C-L: Judaic Studies. One course. *E. Meyers or staff*

221. Readings in Hebrew Biblical Commentaries. Selected Hebrew texts in Midrash Aggadah and other Hebrew commentaries reflecting major trends of classical Jewish exegesis. C-L: Judaic Studies. One course. *Bland*

226B. Exegesis of the Greek New Testament (Romans). Prerequisite: consent of instructor. One course. *Price*

228. Twentieth-Century Continental Theology. An investigation of leading theologians and theological trends. One course. *Osborn*

233. Modern Narratives and Religious Meanings. A study of kinds of religious meaning or significance in representative American, British, and continental fiction of the first half of the twentieth century. One course. *Kort*

239. Introduction to Middle Egyptian. Grammar and readings in hieroglyphic texts relating to the Old Testament. One course. *Wintermute*

244. The Archaeology of Palestine in Hellenistic-Roman Times. The study of material and epigraphic remains as they relate to Judaism in Hellenistic-Roman times, with special emphasis on Jewish art. C-L: Judaic Studies. One course. *C. Meyers or E. Meyers*

258. Coptic. Introduction to the Sahidic dialect with selected readings from Christian and Gnostic texts. Prerequisite: one year of Greek or consent of instructor. One course. *Wintermute*

283. Islam and Modernism. Cultural, religious, and ideological forces which shape Muslim responses to modernism. One course. *Lawrence*

284. The Religion and History of Islam. Origins and development of the Islamic community and tradition, with particular attention to the religious element. C-L: Comparative Area Studies. One course. *Partin*

285. Introduction to the History of Religions. The history, symbols, rites, and structures of the manifestations of the sacred in the major religious traditions of the world. One course. *Staff*

287. The Scriptures of Asia. Translations of basic texts from the religious traditions of India, China, and Japan. C-L: Comparative Area Studies. One course. *Bradley*

288. Buddhist Thought and Practice. A historical introduction to Buddhist thought and practice, with special attention to their interrelationship in the living religion. One course. *Corless*

COURSES CURRENTLY UNSCHEDULED

50D. The Old Testament

55D. The Religion of the Bible

71B, 72B. Freshman-Sophomore Seminars: Jewish and Christian Traditions

71C, 72C. Freshman-Sophomore Seminars: Analytic, Comparative, and Constructive Studies

103. The Idea of Messiah in the Bible

122. Protestantism and Catholicism in Modern Europe

129. Contemporary Christian Faith and Politics

154. Hegel and Marx on Christianity

238. Jewish Responses to Christianity

243. Archaeology of Palestine in Biblical Times

248. Theology of Karl Barth

255. African Religions

264. The Sociology of the Black Church

265. Religions of the West Africa Diaspora

280. The History of Religions

RELIGION COURSES BY FIELDS

Introductory Courses. Religion 50, 51, 52, 52D, 55, 56, 57, 58, 59.

African and Asian Religions. Religion 57, 71A, 72A, 140, 141, 149, 152, 160, 161, 162, 163, 195A, 196A, 217, 255, 265, 283, 284, 285, 287.

Jewish and Christian Traditions. Religion 50, 50D, 51, 52, 52D, 55, 55D, 71B, 72B, 104, 105, 106, 107, 108, 109, 111, 115-116, 124, 125, 127, 128, 129, 131D, 132D, 134, 135, 139, 195B, 196B, 207, 208, 220, 221, 226B, 228, 239, 243, 248, 258.

Analytic, Comparative, and Constructive Studies. Religion 56, 58, 59, 60, 71C, 72C, 99, 138, 142, 143, 144, 148, 151, 154, 155, 156, 158, 166, 170, 172, 174, 188, 195C, 196C, 212, 233, 238, 264, 280.

THE MAJOR

Major Requirements. Eight courses, which must include at least two introductory courses (numbered 50 through 60). The distribution of courses must also include at least one each from the categories African and Asian traditions; Jewish and Christian traditions; and analytic, comparative, and constructive studies. One of the eight courses must be a junior-senior seminar or a 200-level course.

The student, in consultation with an assigned adviser and with the adviser's approval, should elect four of the eight courses in such a way that they constitute a thematic or methodological concentration on a particular aspect of religion.

To prepare for graduate or professional study of religion, the department recommends that students complete at least four courses in college level study, or the equivalent, of a foreign language. Master of Arts and Doctor of Philosophy programs often require examination in one or two foreign languages. Students planning to attend a theological seminary should note that knowledge of biblical languages, as well as Latin, frequently is presupposed or required. Those planning to pursue studies of Asian religions should begin appropriate language study as part of their undergraduate preparation.

Honors. The department offers work leading to graduation with distinction. For further information consult the Director of Undergraduate Studies and the section on honors in this bulletin.

Reserve Officers Training Program

AIR FORCE AEROSPACE STUDIES (AS)

Professor Hamilton, Lt. Colonel, USAF, *Chairman*; Assistant Professor Trimmer, Captain, USAF, *Director of Undergraduate Studies*; Assistant Professors Audenaert, Captain, USAF and Medlyn, Major, USAF

Eligibility Requirements. All freshmen and sophomores, male or female, are eligible to enroll in the general military course in the Air Force Reserve Officers Training Corps. For enrollment in the professional officer course, the student must have completed successfully either the general military course or the six-week field training course; must execute a written agreement with the government to complete the professional officer course; must be sworn into the enlisted reserve; and must agree to accept a commission in the U.S. Air Force Reserve upon graduation. In addition, each student must take at least one course in mathematical reasoning prior to graduation/commissioning. All students also will be required to attend one hour of leadership laboratory each week.

General Military Courses

First Year

1. United States Military Forces in the Contemporary World. Development of aerospace power in the United States; mission, doctrine, and organization of the

U.S. Air Force and its relationship to the other services within the Department of Defense. (May not be counted to satisfy graduation requirements.) Half course. *Hamilton*

Second Year

51. Development of Air Power. Growth and development of air power from dirigibles and balloons to the present emphasizing evolution of concepts and doctrine governing air power employment in support of national objectives. (May not be counted to satisfy graduation requirements.) Half course. *Trimmer*

Professional Officer Courses

All students selected to continue aerospace studies pursue the following courses:

First Year

105S. Aerospace Leadership and Management. An introduction to management fundamentals to include the knowledge base and process of managing. One course. *Medlyn*

106S. Aerospace Leadership and Management. Application of management fundamentals to duties as junior officers/executives to include principles of leadership. One course. *Medlyn*

Second Year

203. The Problems of Flight. Mandatory for pilot cadets; approval of instructor for all others. Half course. *Medlyn*

205S. National Security Forces in Contemporary American Society. Current questions of the role and function of the professional military officer in a democratic society and the complex relationships in civil-military interactions. One course. *Audenaert*

206S. National Security Forces in Contemporary American Society. Formulation and implementation of American defense policy. One course. *Audenaert*

ARMY MILITARY SCIENCE (MSC)

Professor Covington, Lieutenant Colonel, U.S. Army, *Chairman*; Assistant Professor Boulter, Captain, U.S. Army, *Director of Undergraduate Studies*

11. Introduction to ROTC and the Army. The military organization with emphasis upon tradition, doctrine, and contribution toward national objectives. Half course. *Covington*

15. Leadership Development. Assessment of student's leadership potential followed by development of leadership skills through simulation exercises. Half course. *Covington*

51. Military Topography. Interpretation and use of topographical maps to facilitate land navigation. Consideration of military significance of terrain. Half course. *Boulter*

52. Introduction to Small Unit Tactics. Introduction to planning, organizing, and conducting small unit patrols and offensive/defensive operations. Consideration of application of the principles of war. Half course. *Boulter*

103. Applied Military Leadership. Basic elements of military operations, including methods of military communications, advanced land navigation, military graphics, and all-purpose unit defense. Laboratory (required for ROTC students only) includes practical application of relevant class topics. One course. *Boulter*

104. Military Leadership Theory and Techniques. Introduction to threat forces' tactical doctrine and equipment. Conduct of mounted and dismounted tactical operations and employment of supporting assets. Laboratory (required for ROTC students only) includes practical application of relevant class topics. One course. *Boulter*

131. Military Team. Introduction to the Uniform Code of Military Justice and the Law of War. Organization and structure of active and reserve forces. Laboratory (ROTC students only) includes instructional experience in practical application of relevant class topics. One course. *Covington*

132S. Military Command Management. Analysis of selected problems of military leadership in unit administration. Responsibilities and image of the professional military officer. Laboratory for ROTC students. One course. *Covington*

NAVAL SCIENCE (NS)

Professor Peek, Captain, U.S. Navy, *Chairman*; Associate Professor Kay, Commander, U.S. Navy, *Director of Undergraduate Studies*; Assistant Professors Estes, Major, U.S. Marine Corps and Kundrat, Lieutenant, U.S. Navy

Completion of all naval science courses listed is required for a commission. Fifteen hours of practical and applied leadership are required each semester.

11L. Naval Orientation. Military formations, movements, commands, courtesies and honors, and elements of unit leadership. *Kundrat*

12. Naval Ships Systems. Structure, elements of design, stability, compartmentation, communications, and propulsion systems as they bear on safe operation and combat or service effectiveness. One course. *Staff*

12L. Naval Ships Systems Laboratory. Practical application of the theories and principles of naval ships systems. *Kundrat*

51L, 52L. Seapower and Maritime Affairs Seminar. Contemporary studies in seapower, including an examination of the rise and current status of the Soviet Navy. *Estes*

126. Concepts and Analyses of Naval Tactical Systems. Detection systems; systems integration into current naval platforms and their offensive and defensive capabilities. One course. *Staff*

131. Navigation. Theory, principles, and procedures of ship navigation, movements, and employment. Dead reckoning, piloting, and electronic principles of navigation. Naval Science 131L should be taken concurrently. One course. *Staff*

131L. Navigation Laboratory. Practical application of the theories and principles of navigation as presented in the lecture series. *Staff*

132. Naval Operations. Components of general naval operations, including concepts and application of tactical formations and dispositions, relative motion, maneuvering board and tactical plots, rules of the road, and naval communications. Naval Science 132L is a concurrent requirement. One course. *Staff*

132L. Naval Operations Laboratory. Practical application of the theories of naval operations as presented in the lecture series. *Staff*

141. Evolution of Warfare. Continuity and change in the history of warfare, with attention to the interrelationships of social, political, technological, and military factors. One course. *Estes*

145L. Naval Organization and Management Laboratory. Lines of command and control; organization for logistics, service, and support; research on the practical application of fundamental leadership principles. *Staff*

146L. Naval Ship Administration Laboratory. Concepts and applications of naval justice, shipboard administration, and training. *Staff*

151. Amphibious Operations. Development of amphibious doctrine, with attention to its current applications. One course. *Estes*

Romance Languages (RL)

Professor Stewart, *Chairman*; Associate Professor Hull, *Director of Undergraduate Studies*; Professors Cordle, Fein, Osuna, Tetel, and Wardropper; Associate Professors Bryan, Caserta, Garci-Gómez, Orr, Ripley, and Thomas; Assistant Professors Barlow, Hedges, Miller, and Pérez; Visiting Lecturers Sanchez and Stone

French and Spanish 74, 76 or equivalents are the prerequisites for all courses not taught in English. Students who by reason of foreign residence have had special opportunities in French or Spanish must be classified by the Director of Undergraduate Studies.

The intensive language courses 181 and 182 provide an introduction to the language. They are recommended for students who wish to acquire proficiency in a second foreign language before entering graduate school.

In literature, one credit is granted for a score of 3 or 4 and two credits for a score of 5 (French or Spanish 70, 71) on the examination of the advanced placement program. In language, one advanced placement credit (French or Spanish 76) is granted for scores of 3, 4, and 5.

FRENCH (FR)

1-2. Elementary French. Understanding, speaking, reading, and writing French. Language laboratory for recording-listening practice. Two courses. *Staff*

63. Intermediate French. Grammar review, reading, and oral practice, including laboratory experience. One course. *Staff*

70, 71. These numbers represent one or two course credits for advanced placement in literature.

74. Intermediate Readings in Modern French. Readings, discussion, composition, listening practice. One course. *Staff*

76. French Conversation. Practice in speaking and writing everyday French based on contemporary readings. Prerequisite: French 63 or equivalent. One course. *Staff*

101, 102. Introduction to French Literature. An introduction to the major writers of the French literary tradition. Selections and complete works of poetry, fiction, theater, and essay. 101: Middle Ages through the eighteenth century. 102: nineteenth and twentieth centuries. Lectures and discussions; short essays and tests. Conducted in French. Two courses. *Staff*

103S, 104S. Discussions of Readings. Selected topics. Open only to freshmen and sophomores. Two courses. *Staff*

107S. Contemporary Ideas. Readings and discussion of French works which have provoked political or intellectual thought in recent years. For freshmen and sophomores only. One course. *Staff*

110. Advanced Grammar and Composition. A systematic study of the structure of formal French. Practice in writing. One course. *Bryan or Hull*

111. Conversations and Exposés. Contemporary subjects. One course. *Bryan and staff*

113S. French for Business and Law. An introduction to French commercial and legal practices and vocabulary. One course. *Bryan*

114. Language and Civilization of Quebec. Offered only as part of summer program in Montreal. C-L: Canadian Studies. One course. *Staff*

117. French Phonetics. Sounds, rhythm, intonation. Individual practice in language laboratory. Readings in phonetic theory. One course. *Hull*

118. Advanced Translation and Stylistics. Differences between French and English patterns of expression. Levels of usage. Practice in translation. Prerequisite: French 110 or equivalent or consent of instructor. One course. *Hull or Thomas*

122. The French Film. Evolution of techniques and styles from 1895 to the present. Fourteen directors from the silent (Méliès, Dulac, Buñuel) and from the sound era (Renoir, Carné, Truffaut). Taught in English. C-L: Film. One course. *Staff*

131S. French in the New World. French and Creole in Canada, New England, Louisiana, and the Caribbean. Origins, history, linguistic characteristics, current political and social issues. C-L: Canadian Studies and Linguistics. One course. *Hull*

132. Literature and History of Quebec. Offered only as part of summer program in Montreal. C-L: Canadian Studies. One course. *Staff*

137. Aspects of Contemporary French Culture. Offered only as part of summer program in Paris. One course. *Staff*

138. Foundations of French Civilization. Its development up to the Revolution of 1789 in relation to European culture. Readings and discussions in French. One course. *Tetel*

139. Modern French Civilization. Nineteenth- and twentieth-century France; history, institutions, customs, and arts. Readings and discussions in French. One course. *Tetel*

141S, 142S. French Literature. Topics to be announced. Open to juniors and seniors. Two courses. *Staff*

145S. The Sixteenth Century. An introduction to the spirit of the French Renaissance as reflected in the literature of the age of Rabelais and Montaigne, Ronsard, and Du Bellay. C-L: Medieval and Renaissance Studies. One course. *Tetel*

146S. Montaigne and Self-Portraiture. A reading of some *essais* in the light of the self-portrait in Renaissance art. C-L: Medieval and Renaissance Studies. One course. *Tetel*

147. The Roots of Modernity in Seventeenth-Century Literature. Analysis of form and thought in selected works of Descartes, La Fontaine, Madame de Lafayette, Pascal, La Rochefoucauld, and La Bruyère. Emphasis on the innovations and lasting influence of each author. One course. *Staff*

148. French Drama of the Seventeenth Century. The plays of Corneille, Racine, and Molière are read in conjunction with several twentieth-century works to explore dramatic conventions and the difference between tragedy and comedy. C-L: Medieval and Renaissance Studies. One course. *Staff*

151. French Comedy. The theatrical tradition of comedy and its evolution, with emphasis on Molière, Marivaux, and Beaumarchais, and other readings from *Pathelin* to Ionesco. C-L: Drama 152. One course. *Stewart*

152. The Early French Novel. Origins and evolution of the novel in the seventeenth and eighteenth centuries: Madame de Lafayette, Marivaux, Prévost, Rousseau, Diderot, Laclos, Sade. One course. *Stewart*

- 153. The French Enlightenment.** Religion, politics, and philosophic and literary ideas of eighteenth-century France: Montesquieu, Voltaire, Rousseau, and others. One course. *Stewart*
- 155. Romanticism in French Literature.** Romantic theory and practice; including Constant, Chateaubriand, Lamartine, Hugo, Musset, Vigny, and Nerval. One course. *Orr*
- 156. The Age of the Novel.** Flaubert, Balzac, and Stendhal. One course. *Orr*
- 158. Toward Modernism in French Poetry.** An introduction to modern trends in the nineteenth century; emergence from traditional romanticism; Art for Art's Sake and Parnassians (Gautier, Leconte de Lisle); the transition from decadence to symbolism (Baudelaire, Verlaine, Rimbaud, and Mallarmé). One course. *Staff*
- 159. Feminist Fiction.** Works by women in the modern period, including George Sand, Colette, Simone de Beauvoir, and others. One course. *Orr*
- 162S. French Drama of the Twentieth Century.** A survey of literature for the stage from 1890 to the present. One play each of Claudel, Maeterlinck, Jarry, Giraudoux, Cocteau, Ghelderode, Anouilh, Montherlant, Sartre, Camus, Genet, Ionesco, Beckett, Pinget, Vian, and Arrabal. C-L: Drama 154. One course. *Cordle*
- 163. French Poetry of the Twentieth Century.** The symbolist heritage and surrealism: Mallarmé, Apollinaire, Breton, Eluard, Tzara, and others. One course. *Thomas*
- 166S, 167S. Contemporary French Life and Thought.** Major writers of the twentieth century and their historical and cultural circumstances. 166S: Claudel, Gide, Valéry, Proust, Apollinaire, Mauriac, Alain-Fournier, Cocteau. 167S: Giono, Breton, Aragon, Malraux, Sartre, Beckett, Camus, Robbe-Grillet, Sarraute. Two courses. *Cordle*
- 169. The Contemporary Novel in French Canada.** Major trends in the novel since World War II: social revolt, proletarianism, political and religious liberation, and rejection of the past. C-L: Canadian Studies. One course. *Tetel*
- 170. Film and the French Novel.** Relationship between film and the novel in twentieth-century French culture: surrealism (Breton, Clair, Léger), *nouveau roman* (Resnais, Duras, Robbe-Grillet), avant-garde (Sollers, Roche, Marker). C-L: Film. One course. *Staff*
- 181. Intensive French.** An introduction to the language. Prerequisites: four semesters of another foreign language or consent of instructor. One course. *Staff*
- 182. Intensive French.** Readings in modern literature: analysis and discussion. Prerequisite: French 181 or consent of instructor. One course. *Staff*
- 191, 192. Independent Study.** Directed reading and research. Open only to qualified juniors by consent of instructor and Director of Undergraduate Studies. Two courses. *Staff*
- 193, 194. Independent Study.** Directed reading and research. Open only to qualified seniors by consent of instructor and Director of Undergraduate Studies. Two courses. *Staff*
- 210. The Structure of French.** Modern French phonology, morphology, and syntax. Readings in current linguistic theory. C-L: Linguistics. One course. *Hull*

211. History of the French Language. The evolution of French from Latin to its present form; internal developments and external influences. C-L: Linguistics. One course. *Hull*

223. Semiotics for Literature. Theoretical writings in general semiotics by Frege, Peirce, Saussure, Mukarovsky, and Morris and their applications for textual analysis of French literary works by representative contemporary critics such as Eco, Riffaterre, Corti, and Greimas. Taught in English. C-L: Linguistics. One course. *Thomas*

248. French Literature of the Seventeenth Century. The baroque and the classical: form and meaning in the plays of Corneille, Racine, and Molière. Readings in baroque and précieux poetry. C-L: Medieval and Renaissance Studies. One course. *Staff*

251, 252. Literature of the Eighteenth Century. Problems of literary history, critical reading, and interpretation, focused on varying topics. Two courses. *Stewart*

255. French Preromantic and Romantic Poetry. Chénier, Vigny, Lamartine, Musset, Hugo, and Nerval. One course. *Orr*

256. Modern Literature and History. The problems of history, society, and politics in literature, through the writings of Rousseau, Tocqueville, Michelet, Flaubert, Hugo, Merleau-Ponty, Foucault, and others. One course. *Orr*

257, 258. The Nineteenth-Century French Novel. 257: romanticism and romantic realism, studied especially in the works of Chateaubriand, Stendhal, and Balzac. 258: realism and naturalism, with special emphasis on Flaubert and Zola. Two courses. *Orr*

263. Contemporary French Theater. Dramatic theory; the art of the leading directors; and the major texts of Claudel, Giraudoux, Anouilh, Sartre, Beckett, Ionesco, and Genet. One course. *Cordle*

265, 266. French Literature of the Twentieth Century. 265: to 1935, emphasis on Gide, Mauriac, and Malraux. 266: after 1935, emphasis on Sartre, Camus, and the *nouveau roman*. Two courses. *Cordle*

290S. Studies in a Contemporary Figure. A writer, philosopher, critic, or artist. One course. *Staff*

Courses Currently Unscheduled

127. Masterpieces of French Literature in Translation

240. Old French Literature

261. French Symbolism

264. Proust

ITALIAN (IT)

1-2. Elementary Italian. Understanding, speaking, reading, and writing Italian. Language laboratory available for recording-listening practice. Two courses. *Caserta and staff*

63. Intermediate Italian. Grammar review; reading; oral practice, including laboratory experience. One course. *Caserta and staff*

111. Spoken Italian. Intensive instruction in Italian using selected topics and readings to build vocabulary and to provide practice in structural patterns. One course. *Caserta*

139. Modern Italy. Political, social, economic, and cultural problems in Italian history from 1861 to the present. One course. *Caserta*

181. Intensive Italian. An introduction to the language. Prerequisites: four semesters of another foreign language or consent of instructor. One course. *Caserta*

182. Intensive Italian. Readings in modern literature: analysis and discussion. Prerequisite: Italian 181 or consent of instructor. One course. *Caserta*

183, 184. Readings in Italian Literature. Historical and critical analysis. 183: Dante, Petrarch, Boccaccio, and the humanists. 184: Foscolo, Manzoni, Leopardi, and Verga. Conducted in Italian. C-L, 183: Medieval and Renaissance Studies. Two courses. *Caserta*

191, 192. Independent Study. Directed reading and research. Open only to qualified juniors by consent of instructor and of Director of Undergraduate Studies. Two courses. *Staff*

193, 194. Independent Study. Directed reading and research. Open only to qualified seniors by consent of instructor and Director of Undergraduate Studies. Two courses. *Staff*

283. Italian Novel of the Novecento. Representative novelists from Svevo to the most recent writers. One course. *Caserta*

284. Dante. *La Vita Nuova* and a close reading of the *Inferno*. Conducted in English. Reading in Italian or English. C-L: Medieval and Renaissance Studies. One course. *Caserta*

285. Dante. The *Purgatorio* and the *Paradiso* in the light of Dante's cultural world. Special attention will be given to the poetic significance of the *Commedia*. Taught in English. Prerequisite: Italian 284 or equivalent. C-L: Medieval and Renaissance Studies. One course. *Caserta*

Courses Currently Unscheduled

74. Intermediate Readings in Modern Italian

137. The Italian Cinema

PORTUGUESE (PTG)

181. Brazilian Portuguese. An intensive introduction to the language. Prerequisites: four semesters of another foreign language or consent of instructor. C-L: Comparative Area Studies. One course. *Staff*

182. Contemporary Brazilian Theater. Authors studied include Jorge Andrade, Ariano Suassuna, and Dias Gomes. Prerequisite: Portuguese 181 or consent of instructor. C-L: Comparative Area Studies. One course. *Staff*

185, 186. Conversation. Practice in spoken Brazilian Portuguese. Prerequisite: Portuguese 182 or consent of instructor. Two courses. *Staff*

Courses Currently Unscheduled

191, 192. Independent Study

193, 194. Independent Study

SPANISH (SP)

1-2. Elementary Spanish. Understanding, speaking, reading, and writing Spanish. Language laboratory available for recording-listening practice. Two courses. *Staff*

63. Intermediate Spanish. Grammar review; reading; oral practice, including laboratory experience. One course. *Staff*

70, 71. These numbers represent one or two course credits for advanced placement in literature.

74. Intermediate Readings in Modern Spanish. Discussion, composition, listening practice. One course. *Staff*

76. Spanish Conversation. Practice in speaking and writing everyday Spanish based on contemporary readings. Prerequisite: Spanish 63 or equivalent. One course. *Staff*

101, 102. Introduction to Literature. Major writers of the Spanish literary tradition. Poetry, fiction, theater, and essay. 101: Middle Ages through the seventeenth century. 102: eighteenth, nineteenth, and twentieth centuries. Two courses. 101: *Garcí-Gómez and staff*; 102: *Osuna and staff*

103S, 104S. Discussion of Readings. Selected topics. Open only to freshmen and sophomores. Two courses. *Staff*

105. Introduction to Spanish-American Literature. A survey of major writers and movements from the period of discovery to the present day. C-L: Comparative Area Studies. One course. *Fein or Pérez*

106S. Spanish-American Short Fiction. Novelettes and short stories of the twentieth century: Borges, Cortázar, Denevi, Donoso, García Márquez, and others. C-L: Comparative Area Studies. One course. *Fein*

107S. Spanish-American Civilization. An interdisciplinary approach combining art, architecture, cultural anthropology, history of ideas, and, occasionally, music. C-L: Comparative Area Studies. One course. *Fein*

108S. Spanish Traditional Poetry. The Spanish *Romancero*; ballads and other forms of popular poetry. C-L: Medieval and Renaissance Studies. One course. *Garcí-Gómez*

109S. Contemporary Hispanic Ideas. Readings in twentieth-century Spanish and Spanish-American nonfiction. Open only to freshmen and sophomores. One course. *Pérez*

110. Spoken Spanish. Study of colloquial Spanish, practice in pronunciation and conversation, emphasis on oral communication. Prerequisite: Spanish 76 or consent of instructor. One course. *Garcí-Gómez and staff*

111. Written Spanish. Grammatical problems in composition and translations; introduction to the techniques of literary and professional styles. One course. *Pérez and staff*

114S. Spanish Language: Peninsular or American. Topics to be announced. One course. *Staff*

117S. Advanced Grammar. A systematic study of modern Spanish morphology and syntax. One course. *Osuna and staff*

118S. Translation from and into Spanish. Practice in translation, study of professional and model translations, with emphasis on improving skills in the use of both Spanish and English by means of close comparisons of the two languages. One course. *Wardropper and staff*

122. Modern Mexico. A problem-oriented, interdisciplinary approach based on literature, history, the fine arts, and films. Readings in English or Spanish. Taught in English. C-L: History 155. One course. *Fein and TePaske*

131. Topics of Hispanic Civilization. A humanistic study of Spain or Spanish America through history, culture, people, and institutions. One course. *Staff*

141S, 142S. Spanish Literature. Topics to be announced. Open to juniors and seniors. Two courses. *Staff*

144S. Spanish-American Literature of Identity. Exploration of the concepts of *lo criollo* or *lo americano*, essentially through the analysis of texts by Arriví, Carpentier, Neruda, Paz, and others. One course. *Pérez*

146. The Spanish-American Novel. Masterworks of the twentieth century. C-L: Comparative Area Studies. One course. *Fein*

151. Spanish Literature of the Renaissance and the Baroque. Selected works of the sixteenth and seventeenth centuries with attention to their reflection of social, religious, and political ideas. C-L: Medieval and Renaissance Studies. One course. *Wardropper*

153. Golden Age Literature: Cervantes. Emphasis on the *Quijote*. C-L: Medieval and Renaissance Studies. One course. *Staff*

157. The Picaresque Novel. *Lazarillo*, selections from Alemán's *Guzmán de Alfarache*, Quevedo's *Buscón*, and Cervantes' *Novelas ejemplares*. Social and religious satire, comparative analysis of style, portrayal of the delinquent protagonist. C-L: Medieval and Renaissance Studies. One course. *Garci-Gómez*

162. The Romantic Movement. Principal manifestations of romanticism in Hispanic literature; poetry (Becquer, Espronceda, Rosalía de Castro), drama (Rivas, Zorrilla), and the novel (Isaacs, Marmol). One course. *Pérez*

163. The Generation of 1898. Selected works by Unamuno, Baroja, Azorín, Valle-Inclán, and Machado. One course. *Osuna*

165S. Major Spanish Authors. Textual studies; methods of literary interpretation and criticism. One course. *Wardropper*

166. Nineteenth-Century Prose Fiction. Major forms in Spain and Spanish America: Clarín, Blest-Gana, Cambaceres, Galdós, and others. C-L: Comparative Area Studies. One course. *Pérez*

171. Literature of Contemporary Spain. A sociological approach to the novel, theater, and poetry: Goytisolo, Buero Vallejo, Sastre, Arrabal, Celaya, and Otero. One course. *Osuna*

181. Intensive Spanish. An introduction to the language. Modern readings. Prerequisites: four semesters of another foreign language or consent of instructor. One course. *Staff*

182. Readings in Spanish-American Literature. Prerequisite: Spanish 181 or consent of instructor. One course. *Staff*

191, 192. Independent Study. Directed reading and research. Open only to qualified juniors by consent of instructor and Director of Undergraduate Studies. Two courses. *Staff*

193, 194. Independent Study. Directed reading and research. Open only to qualified seniors by consent of instructor and Director of Undergraduate Studies. Two courses. *Staff*

210. History of the Spanish Language. Formation and development. Internal forces and external contributions. C-L: Comparative Area Studies, Linguistics, and Medieval and Renaissance Studies. One course. *Garci-Gómez*

245, 246. Modern and Contemporary Spanish-American Literature. 245: poetry from *Modernismo* to the present. 246: twentieth-century fiction. C-L: Comparative Area Studies. Two courses. *Fein and Pérez*

251. The Origins of Spanish Prose Fiction. Selected examples of the romance and the novel: *Amadís de Gaula*, Diego de San Pedro's *La Cárcel de amor*, the *Abencerraje*,

the *Lazarillo*, Montemayor's *Diana*. C-L: Medieval and Renaissance Studies. One course. *Wardropper*

253. Cervantes. The life and thought of Cervantes with special emphasis on his *Quijote*. C-L: Medieval and Renaissance Studies. One course. *Wardropper*

254. Drama of the Golden Age. The chief Spanish dramatists of the seventeenth century with readings of representative plays of this period. C-L: Medieval and Renaissance Studies. One course. *Wardropper*

258S. Spanish Lyric Poetry before 1700. Selected poems of the Middle Ages, Renaissance, and baroque. Special emphasis on the *Razón de amor*, *la poesía de tipo tradicional*, and Santillana; on Garcilaso, San Juan de la Cruz, Fray Luis de León, and Herrera; on Góngora and Quevedo. C-L: Medieval and Renaissance Studies. One course. *Wardropper*

275. Modern Spanish Poetry. Juan Ramón Jiménez, Unamuno, Antonio Machado, the Generation of 1927, and the contemporary poets. One course. *Osuna*

276. Modern Spanish Drama. The theater of Benavente, Valle-Inclán, Lorca, Casona, Buero Vallejo, Sastre, and Arrabal. One course. *Osuna*

277. Modern Spanish Novel. From the Generation of 1898 to the present. One course. *Osuna*

Courses Currently Unscheduled

121. Latin-American Literature

ROMANCE LANGUAGES (RL)

150. Authorship in the Cinema: Luis Buñuel. An examination of fourteen films from the surrealist period to the present. Style, ideology, and cinematic technique. Taught in English. C-L: Film. One course. *Staff*

218. The Teaching of Romance Languages. Evaluation of objectives and methods; practical problems involved in teaching these languages on the elementary, secondary, and college level; analysis of textbooks, special foreign language programs, audiovisual aids, and tests. Taught in English. One course. *Hull*

THE MAJOR IN FRENCH OR SPANISH

Prerequisite. French or Spanish 74 or 76 or equivalents.

Major Requirements. A total of eight courses numbered 100 or above. These must include 101, 102 (in Spanish, 105 may be substituted for one of these), and at least three courses above 140, of which one must be at the 200 level. Honors candidates may substitute 193, 194 for the 200-level course. Courses numbered 120 through 129 (French and Spanish) are taught in English and do not count toward the major.

Study Abroad. Students are strongly urged to study abroad, since this is the best way to achieve language proficiency and to acquire an intimate knowledge of a country's culture. A maximum of two courses per semester, or one per summer, may be counted toward the major. (The summer course restriction does not apply to Duke-sponsored programs.)

Suggested Work in Related Disciplines. In order to give perspective to a student's program, majors in French or Spanish will normally select, with the approval of the major adviser, appropriate courses from such fields as: (1) other languages and literatures; (2) history; (3) philosophy; (4) courses in music and art; and (5) linguistics.

Russian

For courses in Russian, see Slavic Languages and Literatures.

Science, Technology, and Human Values

Professor Mauskopf, *Director*

The program in Science, Technology, and Human Values offers students the opportunity to develop a comprehensive view of science, medicine, or technology in social, historical, and ethical terms. Although a major is not available in this program, the course of study will enrich the understanding of one's profession for the future scientist, physician, or engineer and will broaden the appreciation of activities in these areas for others.

COURSE OF STUDY

Duke courses pertinent to the program are classified according to three areas: science, medicine, or technology. Within each area, the courses are further divided according to the approach: ethical, analytical (historical, philosophical, or sociological), or policy-centered. Each student entering the program designates, for purposes of advising, an area of primary interest and then selects a program of five courses (minimum) covering all three approaches. Individual programs, selected from more than fifty courses, are tailored to each student's interests.

Students in the program focus their course work and individual interests through a year-long interdisciplinary seminar offered in the senior year for one-half course credit each semester (Interdisciplinary Course 107S-108S). The seminar International Perspectives on Technology, Health, and Public Policy was offered in 1982-83. In 1981-82, seminars on philosophy and biology and on nuclear energy were offered.

Full details concerning the program and courses in Science, Technology, and Human Values may be obtained by writing or calling the Director.

ELIGIBILITY AND CERTIFICATION

Students normally apply to the program at any time before the end of their junior year. Rising seniors may register for the program seminar by satisfying the Director that an appropriate selection of courses will be completed before graduation. On the basis of the expressed area of primary interest, each student is assigned a faculty adviser from the program steering committee, with whom he or she designs a program to suit his or her particular interests. To students who complete the program, Duke University gives official recognition of their participation.

Slavic Languages and Literatures

Professor Krynski, *Chairman*; Associate Professor Jezierski, *Director of Undergraduate Studies and Supervisor of Language Instruction*; Instructor Pugh; Lecturer Sell

RUSSIAN (RUS)

1-2. Elementary Russian. Introduction to understanding, speaking, reading, and writing. Audiolingual techniques are combined with required recording-listening practice in the language laboratory. Two courses. *Staff*

63, 64. Intermediate Russian. Intensive classroom and laboratory practice in spoken and written patterns. Reading in contemporary literature. Prerequisite: Russian 1-2 or two years of high school Russian. Two courses. *Staff*

91, 92. Advanced Russian Conversation and Readings. Conducted in Russian. Prerequisite for 91: Russian 63, 64 or equivalent; for 92: Russian 91. Two courses. *Staff*

91P, 92P. Preceptorial. Elective preceptorials for students enrolled in Russian 91, 92. *Staff*

124. Masters of Russian Short Fiction. Pushkin, Gogol, Turgenev, Tolstoy, Dostoevsky, Chekhov, Babel, and others. Readings in English. C-L: Comparative Area Studies. One course. *Jezierski*

161, 162. Introduction to the Russian Novel. Outstanding works. 161: Lermontov, Gogol, Turgenev, Goncharov, and Tolstoy. 162: Dostoevsky, Bely, Sologub, Bunin, and Gorky. Readings in English. C-L: Comparative Area Studies. Two courses. *Krynski*

175. Leo Tolstoy. Introduction to life and works. Readings in English will include *War and Peace*, *Anna Karenina*, the shorter fiction, dramatic works, and essays. Tolstoy's impact on the literature and thought of today, in and outside of Russia. C-L: Comparative Area Studies. One course. *Jezierski*

176. Fyodor Dostoevsky. Introduction to life and works. Emphasis on his relevance to today's world. Readings in English of major works; close study of *Crime and Punishment*, *The Idiot*, and *The Brothers Karamazov*. Historical overview of critical reaction in Russia and abroad. C-L: Comparative Area Studies. One course. *Jezierski*

177. Introduction to the World of Chekhov. Close scrutiny of selected prose and dramatic works. Readings in English. C-L: Comparative Area Studies and Drama 165. One course. *Jezierski or Krynski*

180. Twentieth-Century Russian Literature. A survey of Russian prose, poetry, and plays by representative authors from Blok to Nabokov. Attention will be given to nonconformist and emigré writers. Readings in English. C-L: Comparative Area Studies. One course. *Jezierski*

183. Slavic Drama and Theater of the Twentieth Century. Russian, Polish, and Czech plays in English. Chekhov, Mayakovsky, Shvarts, Witkiewicz, Gombrowicz, Mrozek, Havel, and others. Emphasis on avant-garde drama, especially of the last twenty-five years, in the context of the western European developments. Opportunity to participate in dramatic readings. C-L: Comparative Area Studies and Drama 163. One course. *Krynski*

191, 192. Independent Study. Directed reading and research. Open only to qualified students by consent of Director of Undergraduate Studies. Two courses. *Staff*

193, 194. Independent Study. Directed reading and research for qualified seniors. Prerequisite: consent of Director of Undergraduate Studies. Two courses. *Staff*

195. Advanced Russian. Review of grammar with an emphasis on the refinement of oral and written language skills. Prerequisite: Russian 92 or consent of instructor. One course. *Staff*

196. Readings in Modern Russian. An intensive reading and conversation course based on contemporary Russian literary and Soviet press texts, emphasizing problems in Russian-English and English-Russian translation. Prerequisite: Russian 195 or consent of instructor. C-L: Comparative Area Studies. One course. *Staff*

For Seniors and Graduates

201, 202. Russian Novel of the Nineteenth Century. 201: 1830-1870. 202: 1870-1900. Prerequisite: Russian 161, 162 or equivalent. C-L: Comparative Area Studies. Two courses. *Krynski*

225. Tolstoy. *War and Peace* and other works. Prerequisite: Russian 175 or equivalent. C-L: Comparative Area Studies. One course. *Jezierski*

232. Dostoevsky. Emphasis on *The Brothers Karamazov* and the theory of the novel. Prerequisite: Russian 176 or equivalent. C-L: Comparative Area Studies. One course. *Jezierski*

POLISH (POL)

11. Beginning Polish. Rapid survey of main elements of grammar. Emphasis on aural comprehension and pronunciation. Prerequisite: one year of any foreign language at the college level. Does not count toward a major in Russian. One course. *Krynski*

12. Intermediate Polish. Elements of grammar continued; speaking and reading. Prerequisite: Polish 11 or consent of instructor. Does not count toward a major in Russian. One course. *Krynski*

174. The Poles: Literature and Society, 1940-1980. Representative literary masterpieces. Emphasis on literary avant-garde of the 1950s and 1960s and on the dissident writings since 1975 and their impact on society. Readings in English. C-L: Comparative Area Studies. One course. *Krynski*

THE MAJOR

Prerequisites. Russian 1-2 and 63, 64 or equivalent.

Major Requirements. A minimum of eight courses in the department. All majors must take the following courses: Russian 91, 92, 195, 196, plus four courses in literature.

Students contemplating graduate work may elect a more intensive program consisting of ten courses. An in-depth knowledge of Russian literature or some knowledge of Polish language and/or literature will facilitate admission to graduate school and subsequent study in the field.

Sociology (soc)

Professor Kerckhoff, *Chairman*; Associate Professor Wilson, *Director of Undergraduate Studies*; Professors Back, McKinney, Maddox, Myers, Palmore, Preiss, Simpson, Smith, and Tiryakian; Associate Professor Campbell; Assistant Professors Brown, Gereffi, O'Rand, and Stark

Sociology offerings represent the subfields and approaches in sociology, and also provide more concentrated work in selected areas: deviant behavior (courses 120, 121, 122, 123); women's studies (111, 118, 150, 165); sociology of the humanities (138, 151, 153, 155, 170); research methods (132, 133, 134, 293, 294, 295, 296, 297); health and health professions (123, 161, 162, 165, 171, 225, 230, 242); organization and management (111, 118, 145, 155, 165, 167, 173); family, life cycle, and human development (111, 118, 150, 151, 152, 155); and international studies (102, 143, 145, 173, 175, 178, 180, 181, 184, 210, 243). The emphasis within many of the courses is focused on studying contemporary research and theory as well as on learning the applications of sociology. Active involvement in the learning process is fostered through seminar courses, independent study, honors work, and internship or fieldwork experiences. The department offers internship courses and

also encourages students to arrange individual internship experiences for which they receive independent study credit if the internship is coordinated with related academic study.

10D. Introduction to Sociology. Structure and dynamics of groups, organizations, and institutions; social behavior over the life cycle; social control and deviance; population and social ecology; formation and change of societies. Two lectures and one discussion section. One course. *Simpson*

Social Issues of Contemporary Society. Topics vary from semester to semester. One course each. *Staff*

- 20S. Individual and Society
- 21S. American Demographics
- 22S. The Third World
- 23S. Social Organization
- 24S. Social History
- 25S. Deviance

49S. The University: A Sociological Perspective. The university's role in society. Sources of power and conflict among students, faculty, and administration. One course. *Campbell*

101. Contemporary American Society. Social trends and social problems and their effects on individuals and society. Urbanization; bureaucracy; distribution of wealth, income, and power; status of minorities. One course. *Kerckhoff or Preiss*

102. America in the Modern World System. Sociological aspects of twentieth-century involvement of the United States in international economic, political, and social affairs, including the notion of American exceptionalism, the roots of American foreign policy, the role of the United States transnational corporations, the contemporary welfare state, the crisis of democracy debate, and the North-South dialogue. One course. *Gereffi*

106. Social Psychology. C-L: Psychology 106. One course. *Staff*

SOCIAL DIFFERENTIATION

111. Inequality in America. Differences in social position in the United States as they relate to income, prestige, and power. Primary focus on the process of achievement, including level of education and occupational position, while controlling for race, sex, and age. One course. *Kerckhoff*

116. Black and White Relations in America. The history and changing nature of interaction between blacks and whites, including the sources and consequences of discrimination, integration, and black power. One course. *Preiss or O'Rand*

118. Sex Roles and Society. Nature and acquisition of sex roles. Cross-cultural variations. Developing nature of sex roles in American society. One course. *O'Rand*

DEVIANCE

Sociology 120-123 are designed as a sequence, and might optimally be taken in that order, with Sociology 120 being recommended preparation for 121, 122, and 123. However, there are no prerequisites.

120. Perspectives on Deviant Behavior. Development and distribution of deviant social behavior, treating such topics as social disorganization; stress and strain; cultural and labeling theories in relation to crime and delinquency, drug addiction, homosexuality, suicide, or others. One course. *Brown and Preiss*

121. Law Enforcement and Judicial Systems. Development and functions of criminal law. Perceptions and handling of crime and deviant behavior by police, prosecutors, and courts. Ethical, fiscal, and operational problems of achieving justice; cross-cultural comparisons. One course. *Preiss*

122. Punishment and Treatment of Deviants. Concepts of punishment and rehabilitation. Programs and facilities for deviants. Structure and operation of "total" institutions, such as prisons and hospitals. Problems of returning to family and community life. One course. *Brown, Preiss, or Simpson*

123. Social Aspects of Mental Illness. Theoretical and practical sociological contributions to problems of etiology, definition, law, and treatment; comparisons with other contributions; questions of public policy and programs. One course. *Back, Preiss, or Palmore*

RESEARCH

132. Research Methods I. Principles of social research, design of sociological studies, sampling, data collection with special attention to survey techniques. One course. *Myers*

133. Research Methods II. Introduction to analysis of data from sociological research and statistical procedures. Interpretation of findings. One course. *Campbell or Myers*

134. Using Sociology. An analytic framework for understanding the ways sociology has been used; ethical issues and consequences. One course. *Campbell, Preiss, or Smith*

138. History of Social Thought. The ideas of Rousseau, Marx, Weber, Durkheim, and others in relation to the philosophy and science of the eighteenth, nineteenth, and twentieth centuries. One course. *Tiryakian or Wilson*

POPULATION AND ECOLOGY

140. Environment and Society. Impact of technological and social change on sociological and environmental conditions. A multidisciplinary approach. One course. *Myers*

143. Business and Labor. Theories and current research on the interlocking roles of business and labor in the United States and elsewhere. One course. *Gereffi or Stark*

145. The Modern City in Comparative Perspective. Historical, demographic, and ecological studies of urban institutions; interaction patterns, differentiation, integration, disorganization, and decentralization. Canadian and other materials. One course. *Myers or Smith*

LIFE COURSE AND INSTITUTIONS

150. The Changing American Family. Structure, organization, and social psychology of marital, parental, and sibling relations over the life cycle of a family; courtship, marriage, family dissolution in relation to contemporary American society; deviations from and alternatives to the traditional nuclear family. One course. *Kerckhoff or Simpson*

151. Sociology of Religion. The religious factor in modern society and the social factor in modern religion. Major sociological theories and marginal religious groupings. One course. *Tiryakian or Wilson*

152. Educational Settings and Processes. Structure and operation of schools, colleges, and universities. One course. *Campbell or Kerckhoff*

153. Sports and Society. The effect of sports on people, their self-image, and social roles. Relation of sports as an institution to the family, education, economics, and politics. One course. *Wilson*

154. Art and Literature in Society. An analysis of the social relations of the world of the arts (painting and sculpture, music, and literature) with emphasis upon creative artists, art publics, art organizations, and art works as they function in their social-cultural milieu. One course. *Back or Tiryakian*

155. Work in America. The labor process. The changing meaning of work. Job satisfaction. Choosing jobs and disengaging from the work role. One course. *Simpson, Stark, or Wilson*

161. Aging and Death. Basic theories and demography of human aging; social problems caused by increased longevity; social-psychological factors in attitudes toward death, mortality, accidental death, suicide, and murder. One course. *Palmore or O'Rand*

162. Health and Illness in Society. Relations between patients and health professionals, and utilization of resources for health care. One course. *Back*

165. Occupations and Career Development. How occupations organize and control labor markets, define services, chart career lines, and develop and sustain occupational identities. One course. *McKinney, Simpson, or Wilson*

167. Uses and Abuses of Power. Theories of and research on political power at the community, national, and international levels. One course. *Gereffi, Preiss, or Smith*

169. Perspectives on Human Development. C-L: Interdisciplinary Course 180 and Psychology 130. One course. *Martin Lakin and Maddox*

SOCIAL ISSUES AND PROCESSES

170. Mass Communication. An analysis of the role of radio, the press, magazines, movies, and television. An examination of the selective audiences, content characteristics, controlling elements, and organizational structure of the various media. Comparative Canadian material considered where feasible. C-L: Canadian Studies and Film. One course. *Smith*

171. Comparative Health Care Systems. The interaction of historical, political, economic, legal/ethical, and sociological factors in the organization and operation of health care systems in the United States, the United Kingdom, Sweden, and elsewhere. One course. *Maddox*

173. Social Conflict and Social Movements. Mobilization and strategy of riots, demonstrations, public interest groups, social movements, and revolutions. One course. *Wilson*

175. Contemporary International Problems: Their Historical Origins and Their Implications for Future Policy. C-L: History 109, Interdisciplinary Course 109, Political Science 160, and Religion 156. One course. *Staff*

177. Structure and Quality of Community Life. Social, psychological, organizational, and geographic communities in traditional, industrial, and developing societies. Quests for community. Lectures and field trips. One course. *Simpson or Tiryakian*

180. Modern Revolutions. Comparative analysis of the causes, processes, and outcomes. French, Russian, and Chinese cases as well as recent revolutions and upheavals. One course. *Stark*

181. Contemporary Socialist Societies. Comparison of forms of inequality, the organization of work, and patterns of opposition. One course. *Stark*

184. An Introduction to Canada and Canadian Issues. C-L: Interdisciplinary Course 184. One course. *Leach*

193, 194. Independent Study. Prerequisite: consent of instructor. Two courses. *Staff*

195S, 196S, 197S. Seminar in Special Topics. Three courses. *Staff*

For Seniors and Graduates

201S. Social Change. Comparisons of alternative theoretical schools of social change and societal transformations: functional, evolutionary, conflict, Marxist, dependency, and world systems perspectives. One course. *Brown, Gereffi, or Tiryakian*

202S. Social Organization. Alternative theoretical perspectives on the bases of social structure—Marxist, exchange, and functionalist. The study of social groups from primary associations to organizations and to community. Processes of differentiation, hierarchy, and conflict. One course. *O'Rand, Simpson, Smith, or Wilson*

210. Comparative Race and Ethnic Relations. Classical theories and current research on racial and ethnic inequality in the United States and in other countries. C-L: Comparative Area Studies. One course. *Staff*

225. Medical Sociology. Current issues in the organization, development, and the utilization of resources for health care. One course. *Back or Maddox*

230. Social Aspects of Aging and Death. Theories of human aging; social problems caused by increased longevity, discrimination against the aged, retirement, widowhood, and other role losses. Social-psychological factors in mortality, accidental death, suicide, and murder. One course. *Palmore or O'Rand*

233S. Culture, Religion, and Modernity. The role of ideas and ideology in the process of social change. The origins and development of modernity in Western and non-Western societies. Patterns of religious expression and cultural integration. One course. *Tiryakian*

234S. Political Economy of Development: Theories of Change in the Third World. See Political Science 234S. C-L: Anthropology 234S, History 234S, and Interdisciplinary Course 234S. One course. *Bergquist, Gereffi, Smith, and Valenzuela*

241. Social Stratification. The nature of hierarchical and vertical differentiation for the economic, political, and prestige structures in modern societies. The interrelationship of class, status, and power strata and their influence on social institutions, personality structure, and group and individual behavior. The transmission of inequality from one generation to the next. One course. *Campbell or O'Rand*

243. Population Dynamics and Social Change. Social scientific aspects of the determinants and consequences of population trends. C-L: Comparative Area Studies. One course. *Myers*

260S. Science, Technology, and Society. Science as a social phenomenon. Relationship of science to technology and their articulation through public policy. Interaction of the institutions of science with other societal institutions. C-L: Psychology 260S. One course. *Bevan and McKinney*

261S. Science, Politics, and Government. C-L: Political Science 205S, Psychology 261S, and Public Policy Studies 255S. One course. *Bevan and McKinney*

276S. Social Structure and the Life Course. The organization of education, career sequences, cohort patterns, role definitions, adolescence, old age, and retirement; variations by race and sex. One course. *Campbell, Maddox, or O'Rand*

277S. Social Patterns of Personal Development. The effects of the family, school, work, and other institutional settings on the individual. One course. *Kerckhoff, O'Rand, or Preiss*

279S. Social Psychology. Study of group structure and processes. Dynamic relations within and between groups and the links between groups and societies. One course. *Back or Preiss*

280S. Contemporary Sociological Theory. An analysis of the structure and foundations of recent formulations of such theoretical approaches as phenomenological sociology, exchange theory, critical theory, structuralism, neo-Marxist sociology, sociobiology, and action theory. One course. *Tiryakian or Wilson*

281S. Development of Sociological Theory. Sociological thought from Comte to contemporary theorists, with particular focus on Parsons and the Parsonian School. The societal and institutional context of the development of sociological theory and paradigms. One course. *Tiryakian or Wilson*

282S. Canada. Counts for the major only with the approval of the Director of Undergraduate Studies. C-L: Interdisciplinary Course 282S. *Leach and Smith*

293. Introductory Statistical Analysis. Basic descriptive statistics, regression and correlation, t-tests and the analysis of variance, chi square techniques, and other topics. Stress on practical applications. Statistical computing using SPSS and other programs. One course. *Campbell*

294. Intermediate Statistical Analysis. The general linear model and its application in methods of multivariate statistical analysis: analysis of variance and covariance, multiple regression and path analysis, and log-linear models for categorical data. Statistical computing using SPSS and other programs. Prerequisite: Sociology 293 or equivalent. One course. *Campbell*

296S. Research Methods and Methodology. Presuppositions and basic questions in the methodology of social scientific research. Alternative research designs and the assumptions and methods of analysis. One course. *Back, Campbell, or Smith*

297S. Data Collection and Analysis. Survey of methods of sociological data collection: observation, experiments, surveys, and historical studies. Issues in the analysis of data: organizing data, coding, indexes, descriptive and analytic measures. Problems of interpretation, verification, and dissemination of research results. One course. *Back, Campbell, or Smith*

298S, 299S. Seminar in Selected Topics. Substantive, theoretical, or methodological topics. C-L, 298S: Canadian Studies. Two courses. *Staff*

COURSES CURRENTLY UNSCHEDULED

176. Immigration and Ethnicity

178. Colonialism, Neocolonialism, and Internal Colonialism

179. Development of Third World Societies

190T. Tutorial in Selected Subjects

205S. Complex Organizations

242. The Sociology of Occupations and Professions

244. Human Ecology and Urban Systems

295. Methodology in Sociology

THE MAJOR

Prerequisite. Sociology 10D or an equivalent course with consent of the Director of Undergraduate Studies.

Major Requirements. Eight courses above 101: Sociology 132, 133, 138, one 200-level course, and four others. Only one independent study credit can be applied to the major; it may not substitute for a required course.

A student may complete a second major in sociology. Requirements and advising are the same for the second major as for the first major.

A *Handbook for Sociology Majors*, available in the office of the Director of Undergraduate Studies, describes areas of concentration, the honors program, and the Sociology Union. It also describes the departmental advising system and the interests of the faculty.

Statistics

Although there is no undergraduate major in statistics, a concentration in statistics is available as part of a major in mathematics or economics. Statistics courses at both introductory and advanced levels are also offered by several other departments. For detailed information on statistics courses, consult *Statistics at Duke*, available from the Department of Mathematics.

Women's Studies

Professor Chafe (history), *Director*

The program in women's studies provides students with an understanding of the forces that shape the position of women in society and develops an appreciation of women's experience. A certificate will be offered for those who complete the requirements of the program. Women's studies students will be expected to major in another discipline, with women's studies a supplement to their major.

The women's studies program requires that students take a total of five related courses. The first requirement is that every student must take an introductory survey course, Interdisciplinary Course 103. Participants also take a basic course in gender roles. This requirement is based on the premise that in order to understand the position of women in society, the process of socialization and acculturation must be understood. Three courses are available in this area, two in anthropology, the other in sociology. They present theoretical perspectives on gender stratification and provide an important introduction to the study of women in specific disciplines. The third requirement is two courses, to be chosen from a wide selection, that deal specifically with women's experience in a particular field whether that be history, religion, literature, or health care. The fourth and final requirement is that students take one course that deals with the way in which women's experience relates to various aspects of society and culture. This progression will create a coherent academic experience introducing students not only to the underlying concepts of women's studies but also to the way in which women's experience fits into a broader study of society, culture, and the interaction of different groups.

The courses listed below may be taken to fulfill the requirements. For a complete description of each course consult the listing of the appropriate department.

Introductory Course

Interdisciplinary Course 103. An Introduction to Women's Studies. *Staff*

Gender Role Courses

Anthropology 115. Sex Roles: A Comparative Perspective. *Staff*

Anthropology 215S. Gender Roles in Cross-Cultural Perspective. *Pearlman*

Sociology 118. Sex Roles and Society. *O'Rand*

Women's Studies Courses

Anthropology 196S. Seminar on the Ideology of Sex Roles. *Staff*

Arabic 173. Women in Modern Arabic Literature. *Cooke*

Classical Studies 196S. Sex Roles in Antiquity. *Stanley*
 English 026S. Twentieth-Century Identity Novels. *Dearlove*
 English 026S. American Women's Poetry. *Pope*
 English 139S. Modern British Feminist Novel. *Mellow*
 English 179S. Archetypal Patterns in Women's Fiction. *Pope*
 French 141S. Women Writers of the Renaissance. *Tetel*
 French 142S. Feminist Fiction. *Orr*
 History 169, 170. The Social History of American Women. *Scott*
 History 171. A History of Women in Europe. *Neuschel*
 Nursing 222. Issues in Women's Health Care. *Dery*
 Philosophy 122. Philosophical Issues in Feminism. *Jackson*
 Political Science 163. Women in Developing Societies. *O'Barr*
 Political Science 200A. Gender Roles in American Politics. *O'Barr*
 Religion 109. Women in the Biblical Tradition: Image and Role. *C. Meyers*
 Religion 125. Women and Sexuality in the Christian Tradition. *Clark*

Courses on Women in Relation to Society and Culture

Anthropology 137. Incest, Adultery, and Other Problems in Kinship and Marriage. *Domínguez or Quinn*
 English 188. Literature and Film. *Gaines*
 History 160. The United States from the New Deal to the Present. *Chafe*
 History 227-228. Recent United States History: Major Political and Social Movements. *Chafe*
 Nursing 169. Human Sexuality. *Wallsten*
 Political Science 129. Political Participation. *Paletz*
 Political Science 187. Politics and the Libido. *Paletz*
 Public Policy Studies 195S. Child Policy in the United States. *Stack*
 Public Policy Studies 276S. National Policies and the Family. *Stack*
 Psychology 135. Hormones and Behavior. *Erickson*
 Sociology 111. Inequality in America. *Kerckhoff*
 Sociology 150. The Changing American Family. *Kerckhoff or Simpson*

THE PROGRAM

Students are eligible for a certificate in women's studies after completing the introductory course, one course on gender roles, two courses that deal exclusively with women's experiences, and one course that deals with women in relation to society and culture. The women's studies program will provide academic advice and assistance to students who become part of the program. Information is available at the Office of Women's Studies, 119 East Duke Building; (919) 684-5683.

Writing

For courses in writing, see Institute of the Arts.

Zoology (zoo)

Professor Wainwright, *Chairman*; Associate Professor Lundberg, *Director of Undergraduate Studies*; Professors Barber, Costlow, Fluke, Gillham, Gregg, Klopfer, Livingstone, Nicklas, Schmidt-Nielsen, Staddon, Tucker, Vogel, Ward, and H. Wilbur; Associate Professors Forward, McClay, H. Nijhout, and Sutherland; Assistant Professors Conner, M. Nijhout, Rausher, and Uyenoyama; Adjunct Professor Schmidt-Koenig

The introductory course, Principles of Biology, is listed under Biology in this bulletin. See also Introductory Animal Diversity, below.

In addition to those courses bearing the *S* or *T* suffix, and independent study, the following zoology laboratory courses also count for the requirement for small-group learning experiences: 120L, 204L, 216L, 224L, 226L, 258L.

COURSES GIVEN ON THE DURHAM CAMPUS

74L. Introductory Animal Diversity. Structure, functions, and habits of animals; classification, evolutionary origins, and phylogenetic relationships of

major extant groups. Open only to students intending majors in the natural sciences. One course. *Rausher*

100. Perspectives on Living Systems. Presentation of a viewpoint on living systems. The content and format are determined by the instructor. For upperclass students not intending majors in a biological science. May be substituted for Biology 14L only with the consent of the Director of Undergraduate Studies in zoology. One course. *Staff*

103L. Principles of Ecology. Physical, chemical, and biological processes that determine the distribution and abundance of animals, emphasizing population dynamics, species interaction, biogeography, nutrient cycling, and energy flow through food webs. Prerequisites: introductory biology and Mathematics 31. Laboratory includes fieldwork. One course. *Livingstone*

108L. Developmental and Comparative Anatomy of Vertebrates. The embryology, anatomy, and evolutionary development of vertebrate organ systems. Prerequisite: introductory biology. One course. *Lundberg*

116. Structure. Physical structure and its role in art, science, and technology. Lectures and laboratory and studio exercises in analysis, design, and creation of structure. Does not count toward the distributional requirements. C-L: Art 116 and Engineering 116. One course. *Pearsall, Smullin, and Wainwright*

117. Introduction to Genetics. The effects of heredity and environment upon the individual and the population. Readings and discussions dealing with human problems. Not intended for students whose professional goals are genetics or cell biology. Students may not receive credit for both Zoology 117 and 180. Prerequisite: introductory biology or consent of instructor. C-L: University Program in Genetics. One course. *Ward*

120L. Ornithology. The classification, adaptations, and natural history of birds. Fieldwork. Prerequisite: introductory biology; Zoology 108L recommended. One course. *Bailey*

129. Morphogenetic Systems. Introduction to the experimental study of development. Gametogenesis and fertilization, formation of primary axes, interactions of nucleus and cytoplasm, morphogenetic movements, embryonic induction, regeneration, energetics. Prerequisite: introductory biology. C-L: Zoology 229. One course. *Gregg*

145. Radiations in Biology. Kinds of radiations, related biological hazards and benefits. Levels of concern in plants and animals, including humans. Protection, cellular repair processes. Prerequisites: introductory biology and Chemistry 12. One course. *Fluke*

151L. Principles of Physiology. Functional aspects of respiration, circulation, neural and hormonal coordination, water balance, metabolism, thermoregulation, and responses to special environments. Prerequisites: introductory biology and Chemistry 12. One course. *Conner or Tucker*

160. Principles of Cell Biology. Structure and function of organelles, metabolism, and regulatory mechanisms. Prerequisites: introductory biology and Chemistry 12. One course. *McClay or M. Nijhout*

160L. Principles of Cell Biology. See Zoology 160. Includes laboratory. One course. *McClay or M. Nijhout*

178. Functional Morphology. Structural basis of function of tissues, organs, and organisms in various phyla. Not open to students who have had Zoology 179. Prerequisite: Zoology 108 or 175 or 176 or consent of instructor. One course. *Wainwright*

179T. Tutorial in Functional Morphology. See Zoology 178. Essays and oral reports. Not open to students who have had Zoology 178. Prerequisite: consent of instructor. One course. *Wainwright*

180. Principles of Genetics. Structure and properties of genes and chromosomes in individual organisms and in populations. Prerequisites: introductory biology and Chemistry 12 and Mathematics 31 or equivalents. C-L: Botany 180, Botany 280, University Program in Genetics, and Zoology 280. One course. *Antonovics, Boynton, and Gillham*

191, 192. Independent Study. For junior and senior majors with consent of Director of Undergraduate Studies and supervising instructor. Three courses of 191, 192, 193T, and 194T maximum. Credit to be arranged. *Staff*

193T, 194T. Tutorial. For junior and senior majors with consent of Director of Undergraduate Studies and supervising instructor. Three courses of 191, 192, 193T, and 194T maximum. Credit to be arranged. *Staff*

196D. Human Sex and Sexuality. Anatomical, physiological, and psychological aspects of sexuality. Weekly lectures by specialists. Does not satisfy major, distributional, or fields of knowledge requirements. One course. *Staff*

For Advanced Undergraduates and Graduates

201L. Animal Behavior. Physiological and developmental studies. Laboratory emphasizes research projects. Prerequisites: physiology and genetics or consent of instructor; evolution recommended. One course. *Klopper*

204L. Community Ecology. Theoretical approach to competition, predation, food webs, and species diversity. Laboratories emphasize biometrical design and analysis of experimental field studies. Individual projects and weekend field trips. Prerequisites: Zoology 103L and calculus and consent of instructor. One course. *H. Wilbur*

216L. Limnology. Lakes, ponds, and streams; their origin, development, geochemistry, energy balance, productivity, and the dynamics of plant and animal communities. Laboratory includes field trips. Prerequisites: introductory biology and Chemistry 12 and Mathematics 32 and physics or consent of instructor. One course. *Livingstone*

222L. Entomology. The biology of insects: diversity, development, physiology, and ecology. Field trips. Prerequisite: introductory biology. One course. *H. Nijhout*

226L. Ichthyology. Diversity, evolution, natural history, and ecology of fishes. Laboratory includes overnight field trips to marine and freshwater habitats. Prerequisites: introductory biology and Zoology 108L. One course. *Lundberg*

233. Principles of Insect Behavior. Processes governing the behavior of animals as illustrated by insects. Neural integration, communication, genetics, ecology, and evolution of individual and social behavior. Invertebrate zoology or entomology recommended. One course. *Conner and Rausher*

237L. Systematic Biology. Theory and practice of identification, species discovery, phylogeny reconstruction, classification, and nomenclature. Prerequisites: introductory biology and one course in animal or plant diversity. One course. *Lundberg*

244. Principles of Immunology. An introduction to the molecular and cellular basis of the immune response. Topics include anatomy of the lymphoid system, lymphocyte biology, antigen-antibody interactions, humoral and cellular effector mechanisms, and control of immune responses. Prerequisites: Zoology 160

and Chemistry 152 and consent of instructor. C-L: Microbiology 244. One course. *McClay and Whisant (microbiology)*

247S. Photobiology. Effects of visible light and of ultraviolet and near ultraviolet radiation in living systems: repair processes, quantum processes, physical optics. Prerequisites: college physics and introductory biology. One course. *Fluke*

249. Biomechanics. Principles of fluid and solid mechanics applied to biological systems. Prerequisites: Physics 51 and Mathematics 31 or equivalents. One course. *Vogel and Wainwright*

252. Comparative Physiology. Physiological mechanisms in relation to animal life in nature. One course. *Schmidt-Nielsen*

258L. Laboratory Research Methods. Radioactivity and scintillation counting, spectrophotometry and enzyme kinetics, protein and cell component separatory methods, and other analytical methods, according to individual research interests. Prerequisite: consent of instructor. One course. *Fluke and staff*

259L. Laboratory in Biomechanics. Introduction to instruments used in investigations of solid and fluid biomechanics. Exercises and individual projects. Prerequisite: Zoology 249. One course. *Vogel and Wainwright*

261. Biology of Parasitism. How parasites, from viruses through vertebrates, have solved the special problems associated with their dependence on other organisms. Prerequisites: Zoology 74L and 160. One course. *M. Nijhout*

264S. Chromosomes, DNA, and Evolution. The impact of chromosome and DNA-sequence organization on evolution and vice versa: karyotype changes and speciation; repetitive DNA, split genes, jumping genes, and evolutionary mechanisms; the evolution of mitosis and the chromosome cycle. Prerequisite: cell biology or genetics. C-L: Microbiology 264S and University Program in Genetics. One course. *Nicklas*

269. Advanced Cell Biology. Structural and functional organization of cells and their components with emphasis on current research problems and prospects. Prerequisite: introductory cell biology or consent of instructor. C-L: Anatomy 269, Botany 269, and Microbiology 269. One course. *Nicklas and staff*

275L. Advanced Invertebrate Zoology. Classification, structure, function, and evolution of specified invertebrates. Field work, written and oral reports. Prerequisites: invertebrate zoology and consent of instructor. One course. *Wainwright*

286. Evolutionary Mechanisms. Population ecology and population genetics of plants and animals. Fitness concepts, life history evolution, mating systems, genetic divergence, and causes and maintenance of genetic diversity. Prerequisite: genetics. C-L: Botany 268 and University Program in Genetics. One course. *Antonovics and H. Wilbur*

293L. Population Biology. Theoretical approach to population genetics, life table mathematics, life-cycle evolution in plants and animals, population dynamics, and regulation. Laboratories emphasize experimental methods. Individual projects and weekend field trips. Prerequisites: calculus and ecology and consent of instructor. C-L: Botany 293L. One course. *Antonovics and H. Wilbur*

295S, 296S. Seminar. Topics, instructors, and course credits announced each semester. *Staff*

COURSES GIVEN AT BEAUFORT

Consult Marine Sciences in this bulletin for offerings at the Duke University Marine Laboratory, Beaufort, North Carolina, and for details of the fall, spring, and summer programs for undergraduates at Beaufort.

114L. Introduction to Biological Oceanography. Physical, chemical, and biological processes of the oceans, emphasizing special adaptations for life in the sea and factors controlling distribution and abundance of organisms. Laboratory emphasis. Not open to students who have had Geology 53 or Botany 53. Prerequisite: introductory biology. One and one-half courses. *Cahoon (visiting summer faculty)*

150L. Physiology of Marine Animals. Environmental factors, biological rhythms, and behavioral adaptations in the comparative physiology of marine animals. Prerequisites: introductory biology and chemistry. C-L: Zoology 250L. One course. *Forward*

167. Analysis of Marine Ecosystems. Major marine ecosystems, the physical and biological characteristics of each as a functional entity. Lectures and discussion. Prerequisites: Biology 14 and Chemistry 12. C-L: Botany 167. One course. *Barber*

169L. Ecological Oceanography. Dynamics of marine communities in the context of current ecological theory. Life history strategies, competition, predation, diversity, and stability; detailed considerations of benthic and pelagic communities. Students may not receive credit for both Zoology 103L and 169L. Prerequisites: introductory biology and Mathematics 31. One course. *Sutherland*

176L. Marine Invertebrate Zoology. Structure, functions, and development of invertebrates collected from estuarine and marine habitats. Not open to students who have had Zoology 175 or 274. Prerequisite: introductory biology. One and one-half courses. *Bookhout*

191, 192. Independent Study. For junior and senior majors with consent of Director of Undergraduate Studies and supervising instructor. Three courses of 191, 192, 193T, and 194T maximum. Credit to be arranged. *Staff*

193T, 194T. Tutorial. For junior and senior majors with consent of Director of Undergraduate Studies and supervising instructor. Three courses of 191, 192, 193T, and 194T maximum. Credit to be arranged. *Staff*

For Advanced Undergraduates and Graduates

203L. Marine Ecology. Application of ecological theory to marine systems. Mathematical properties of population growth and species interactions; field and laboratory projects with computer-assisted analysis of data. Practice in scientific writing. Readings from current scientific publications. Prerequisites: introductory biology or invertebrate zoology and calculus; knowledge of statistics recommended. One and one-half courses. *Sutherland*

215L. Primary Productivity in the Seas. Prerequisites: introductory biology and chemistry. C-L: Botany 215L. One course. *Barber and Ramus*

250L. Physiology of Marine Animals. See Zoology 150L. One course. *Forward*

274L. Marine Invertebrate Zoology. Structures, functions, and habits of invertebrate animals under natural and experimental conditions. Field trips. Not open to undergraduate students who have had Zoology 175 except by consent of Director of Undergraduate Studies. Prerequisite: introductory biology. One and one-half courses. *Barnes (visiting summer faculty)*

278L. Invertebrate Developmental Biology. Gametogenesis, fertilization, and development of invertebrates, with emphasis on experimental studies of prelarval stages. Prerequisite: consent of instructor. One and one-half courses. *McClay and visiting staff*

295S, 296S. Seminar. Topics, instructors, and course credits to be announced. *Staff*

COURSES CURRENTLY UNSCHEDULED

175L. Invertebrate Zoology

197, 198. Undergraduate Colloquium

224L. Herpetology

239S. Biogeography

245. Radiation Biology

283. Extrachromosomal Inheritance

THE MAJOR

Students may obtain a copy of the *Handbook for Zoology Majors* from the office of the Director of Undergraduate Studies. The handbook describes the advising system and special programs, and gives the interests and background of the faculty. Possible areas of concentration are molecular and cellular biology (cell physiology, cytology, genetics, development); organismic biology (comparative physiology, comparative and functional morphology, embryology); population biology (population genetics, speciation, systematics, biogeography); animal behavior; ecology (including biological oceanography and limnology); marine sciences.

For the A.B. Degree

Prerequisite. Biology 14 or consent of Director of Undergraduate Studies.

Corequisites. Zoology 74L or consent of Director of Undergraduate Studies; Mathematics 31, 32, or 34; Chemistry 11, 12, 151; and Physics 51, 52.

Major Requirements. A minimum of eight courses, not including the above prerequisites and corequisites, but including at least five zoology courses; four of these must be other than independent study, tutorials, or seminars, and at least two must have related laboratory experience (not including Zoology 74L). The zoology courses must represent at least three of these five areas: genetics, cell biology, physiology, ecology, and evolution. The eight courses may include as many as three nonzoology courses taken in appropriate related departments at the 100 level or above (in chemistry, above organic chemistry), which have prior approval of the Director of Undergraduate Studies for zoology. No one course may be used to satisfy the requirements for zoology and another major, or for a zoology major and a second or third division distributional requirement.

For the B.S. Degree

Prerequisite. Biology 14 or consent of Director of Undergraduate Studies.

Corequisites. Zoology 74L or consent of Director of Undergraduate Studies; Mathematics 31, 32, or 34; Chemistry 11, 12, 151; and Physics 51, 52.

Major Requirements. Same as for the A.B. degree requirements except that a minimum of nine courses, not including the above prerequisites and corequisites, is required. These may include as many as four nonzoology courses taken in appropriate related departments. All other qualifications and restrictions are identical with those for the A.B. degree.

Other Major Programs

As an alternative to the above programs, a student with unusual interests in zoology may arrange a negotiated program of study leading to the Bachelor of Arts or Bachelor of Science degree. After appropriate discussion with departmental faculty, a student may devise a program of study which must be endorsed by two members of the faculty and approved by the undergraduate director. The statement of the proposed program must make clear why the negotiated major is more appropriate than a conventional major. Such a program must be arranged before the start of a student's fifth semester. The only formal limitation on this approach to the major is that it include at least five courses in zoology to meet the minimum Trinity College requirements. See the *Handbook for Zoology Majors* for additional details.

An interdepartmental program may be pursued instead of a departmental major. The Director of Undergraduate Studies for zoology may arrange administrative responsibility for such programs. See requirements under Biology for the major in biology.

Honors

The department offers a program for graduation with distinction in zoology. See the section on honors in this bulletin. The Director of Undergraduate Studies can provide more details.

School of Engineering

Professor Pearsall, *Dean*; Professor Shepard, *Associate Dean*

ENGINEERING (INTERDEPARTMENTAL) (EGR)

11. Engineering Graphics. Graphical theory and techniques for engineering design and communication. Visualization and conventional representation of points, lines, surfaces, and objects using freehand sketches. Orthographic (including sectional and auxiliary), perspective, isometric, and oblique views. Introduction to working drawings. Elements of descriptive geometry. Half course. *Arges*

23. Principles and Practices in Engineering Economics. Introduction to the principles and practices in engineering economics. The initial set of lectures develops a general understanding of basic engineering economics and break-even analysis/minimum cost in engineering design. The second set of lectures focuses on industrial practices and public projects: interest formulas, annual and present worth, as well as taxes and depreciation. The final lectures address forecasting and uncertainty in engineering economics. One course. *Peirce*

24. Environmental Engineering Science. The technical fundamentals of the five major areas of environmental engineering science—water quality, air quality, noise control, solid and hazardous wastes, and professional ethics—are introduced with case studies and real-world examples. Prerequisite: Chemistry 11. One course. *Vesilind*

51. Computers in Engineering. Introduction to use of digital computers in engineering. Attributes of digital computer systems; program languages, flow charts; numerical analysis, including approximation and interpolation, searches and maximization, linear equations; applications to engineering; introduction to decision processes in engineering, including linear programming, optimization network methods; punched card operation; graphical output. Not open to students who have completed Computer Science 51. One course. *Carroll, Hight, Melosh, Owen, Pas, Ulku, or Wright*

75. Mechanics of Solids. Analysis of force systems and their equilibrium as applied to engineering systems. Stresses and strains in deformable bodies; mechanical behavior of materials; applications of principles to static problems of beams, torsion members, and columns. Selected laboratory work. Prerequisites: Physics 51 and Mathematics 32. One course. *Arges, Muga, or J. F. Wilson*

83. Structure and Properties of Solids. Introduction to materials science and engineering, emphasizing the relationships between the structure of a solid and its properties. Atomic and molecular origins of electrical, mechanical, and chemical behavior are treated in some detail for metals, alloys, polymers, ceramics, glasses, and composite materials. Prerequisites: Chemistry 11 and Mathematics 31. One course. *Cadien, Cocks, Jones, Pearsall, or Shepard*

101. Thermodynamics. A rigorous development of engineering thermodynamics, emphasizing the logical structure and manipulation. Classical and statistical concepts of the laws of thermodynamics. Energy and entropy analyses of thermodynamic systems. Property relationships. Chemically reactive systems. Application to power production and energy conversion. Prerequisites: Physics 51 and Mathematics 103. One course. *Elsevier or Harman*

116. Structure. Physical structure and its role in art, science, and technology. Lectures and laboratory/studio exercises in analysis, design, and creation of structure. C-L: Art 116 and Zoology 116. One course. *Pearsall, Smullin, and Wainwright*

123. Dynamics. Principles of dynamics of particles, rigid bodies, and selected non-rigid systems with emphasis on engineering applications. Kinematic and kinetic analysis of machine elements in a plane and in space using graphical and analytical vector techniques. Absolute and relative motion analysis. Work-energy; impact and impulse-momentum. Introduction to vibrations, wave motion, and Lagrange's equations. Prerequisites: Mathematics 103 and Engineering 75 or consent of instructor. One course. *Buzzard, Petroski, or J. F. Wilson*

130. Modeling and Analysis of Dynamic Systems. Mathematical modeling of mechanical, electrical, fluid, and thermal systems. Emphasis is placed on a universal approach to system analysis. Topics include: state variables, linearization methods, transfer functions and block diagrams, and feedback techniques for the control of dynamic systems. Prerequisites: Mathematics 103 and Physics 51. One course. *Garg*

135. Continuum Mechanics. The concept of continua. Vectors. Cartesian tensors. Stress, deformation, and velocity fields. Constitutive equations. Mechanical properties of solids and fluids. Simple problems in elasticity, viscoelasticity, and plasticity. Prerequisites: Mathematics 104 or 111 and Physics 51. One course. *Petroski*

151. Computer Simulations in Engineering. Simulation of various engineering systems, starting from their mathematical formulations. Simulation of the boundary value, eigenvalue, and the initial value problems. Examples from the beam-, truss-, and plate-theories, the fluid flow, the heat transfer, and the dynamics of mechanical and electrical systems. Use of widely used numerical algorithms. Identification of the problems associated with numerical simulations. Prerequisite: junior standing in engineering. One course. *Utku*

165. Special Topics in Engineering. Study arranged on special engineering topics in which the faculty have particular interest and competence as a result of research or professional activities. Prerequisite: consent of instructor(s). Quarter course, half course, or one course. *Staff*

172A. Contemporary Science: Issues and Challenges. Historical roots of big science through current topics in research and controversy. C-L: History 172A. One course. *Mauskopf and Petroski*

172B. Contemporary Technology: Issues and Challenges. Historical roots of technology assessment and regulation through current topics of research and development and controversy. C-L: History 172B. One course. *Mauskopf and Petroski*

174. Technology Assessment and Social Choice. Societal, economic, environmental, psychological, and ethical considerations in the design and application of technological systems; techniques for technological forecasting and assessment; citizen participation in policy making; recent case studies; interdisciplinary team project. C-L: Public Policy Studies 174 and Religion 174. One course. *Garg and McCollough*

175. Aesthetics, Design, and Culture. An examination of the role of aesthetics, both as a goal and as a tool, in a culture which is increasingly dependent on technology. Visual thinking, perceptual awareness, experiential learning, conceptual modeling, and design will be explored in terms of changes in sensory environment. Design problems will be formulated and analyzed through individual and group design projects. Fall semester. One course. *Pearsall*

183, 184. Projects in Engineering. Courses in which engineering projects of an interdisciplinary nature are undertaken. The projects must have engineering relevance in the sense of undertaking to meet human need through a disciplined approach under the guidance of a member of the engineering faculty. Prerequisite: consent of instructor. Two courses. *Staff*

187. History of Nuclear Energy: Civilian Applications. Development and exploitation of nuclear energy for civilian uses, from earliest scientific theories of nuclear physics through the breeder reactor. C-L: History 187. One course. *Petroski and Roland*

188. History of Nuclear Energy: Military Applications. Development and exploitation of nuclear energy for military uses, from the earliest scientific theories of nuclear physics through the neutron bomb. C-L: History 188. One course. *Petroski and Roland*

Biomedical Engineering (BME)

Professor Clark, *Chairman*; Associate Professor von Ramm, *Director of Undergraduate Studies*; Professors Barr, Hammond, Hochmuth, McElhaney, Nolte, Pilkington, Thurstone, and Wolbarsht; Associate Professor Burdick

Biomedical engineering includes the application of concepts and methods in the physical, mathematical, and engineering sciences to biology and medicine. This definition covers a broad spectrum ranging from formalized mathematical theory through experimental science to practical clinical applications. The undergraduate program in biomedical engineering is flexible and can satisfy the requirements for entrance to graduate work in engineering, physiology, biology, or medicine.

Opportunities for student research are available in the biomedical engineering laboratories. The department utilizes digital computers extensively, and computer science techniques are applied in acquiring, processing, and modeling biological data. Research in the biomedical materials laboratory is directed toward the development of materials suitable for use in biological environments such as the vascular system. Biomedical engineering in pediatric cardiology involves study of the electrical activity of the heart in animals and humans, to increase the basic knowledge of the heart itself. The ultrasound imaging laboratories are employed for research and instruction in the biomedical application of this important

technique. Ultrasound instrumentation measures and images biological tissue structures, and the laboratories are equipped with a variety of advanced ultrasonic imaging instruments, as well as a dedicated VAX 11/780 computer for image processing. The biomechanics laboratory is equipped to measure biomechanical responses of tissues and organs and gait parameters, and to test protective headgear and develop new prosthetic devices. A membrane and cell biomechanics laboratory is equipped with several microscopes, electromechanical and pneumatic micromanipulators, and video systems dedicated to the study of the elastic and viscous behavior of living cells and membranes, especially normal and abnormal human red-cell membranes.

101. Electrobiolgy. An exploration of the biophysical and chemical bases of bioelectricity as well as the technologies of bioelectric signal evocation, recording, analysis, and simulation. Topics will range from the ionic mechanisms of membrane potentials to the bioelectric control of neuro-muscular systems. Prerequisites: Physics 52 and Electrical Engineering 61. One course. *Staff*

110. Introductory Biomechanics. Static and dynamic analysis of biological systems; analysis of gait and locomotion; ballistocardiography; biomechanical aspects of various sport activities, diving, and jumping; power, work, and energy concepts applied to the human body; strength and properties of tissue; and injury mechanisms and tolerance. Prerequisite: Mathematics 31. One course. *Hochmuth and McElhaney*

132. Statistical and Computational Methods in Signal Processing. Prerequisite: Mathematics 117 or 135. C-L: Electrical Engineering 132. One course. *Nolte*

132X. Statistical and Computational Methods in Signal Processing. Introduction to fundamental concepts of signal processing with particular emphasis on assessing the sensitivity of the model estimators to uncertainties in measured data. Extensive computer simulations. Prerequisite: Mathematics 117 or 135. One course. *Pilkington*

145. Chemical Thermodynamics. Thermodynamic properties and thermodynamic state. Exchange of heat and work in quasi-equilibrium processes. Chemical and phase equilibria of multicomponent mixtures. Prerequisite: junior standing. One course. *Clark and Hochmuth*

163, 164. Biomedical Electronics and Measurements. A study of the basic principles of biomedical electronics and measurements with emphasis on the operational performance and selection of transducers, instruments, and systems for biomedical data acquisition and processing. Selected laboratory work emphasizes the measurements of specific physiological events. Prerequisite: Electrical Engineering 61. Two courses. *Hammond, Thurstone, or von Ramm*

191, 192. Projects in Biomedical Engineering. For seniors who express a desire for such work and who have shown aptitude for research in one area of biomedical engineering. Half course to two courses. *Staff*

202. Biomedical Transfer Processes. An introduction to biomedical diffusion and momentum transfer processes with particular emphasis on physical models of biological and artificial organ systems. One course. *Clark and Hochmuth*

204. Measurement and Control of Cardiac Electrical Events. Design of biomedical devices for cardiac application based on a review of theoretical and experimental results from cardiac electrophysiology. Evaluation of the underlying cardiac events using computer simulations. Examination of electrodes, amplifiers, pacemakers, and related computer apparatus. Construction of selected examples. Prerequisites: Biomedical Engineering 101 and 163 or equivalents. One course. *Barr*

205, 206. Microprocessors and Digital Instruments. Design of microcomputer-based devices including both hardware and software considerations of system design. Primary emphasis on hardware aspects, including a progression through initial design, prototype construction in the laboratory, testing of prototypes to locate and correct faults, and final design evaluation. Evaluation includes examination of complexity, reliability, and cost. Design and construction oriented toward biomedical devices or instruments that include dedicated microcomputers, usually operating in real time. Prerequisites for 205: Engineering 51 and Biomedical Engineering 163, 164 or equivalents; for 206: satisfactory work in 205. Two courses. *Barr, Hammond, and von Ramm*

215. Biomedical Materials and Artificial Organs. Chemical structures, processing methods, evaluation procedures, and regulations for materials used in biomedical applications. Applications include implant materials, components of *ex vivo* circuits, and cosmetic prostheses. Primary emphasis on polymer-based materials and on optimization of parameters of materials which determine their utility in applications such as artificial kidney membranes and artificial arteries. Prerequisite: Engineering 83 or Chemistry 151 or consent of instructor. C-L: Mechanical Engineering 215. One course. *Clark*

230. Biomechanics. Kinematic models of human motions, mechanical properties of bone and soft tissues, hydrodynamics of micturition, load directed growth mechanisms, human tolerance to impact and vibration, head injury criteria applied to helmet design. Prerequisite: consent of instructor. One course. *McElhaney*

243. Computers in Biomedical Engineering. An in-depth study of the use of computers in biomedical applications. Hardware, software, and applications programming. Data collection, analysis, and presentation studied within application areas such as monitoring, medical records, computer-aided diagnoses, computer-aided instruction, M.D.-assistance programs, laboratory processing, wave form analysis, hospital information systems, and medical information systems. One course. *Hammond*

265. Advanced Topics in Biomedical Engineering. Advanced subjects related to programs within biomedical engineering tailored to fit the requirements of a small group. Prerequisite: consent of instructor. One course. *Staff*

COURSES CURRENTLY UNSCHEDULED

201. Analysis of Bioelectric Phenomena

207. Experimental Mechanics

221. Electrophysiological Techniques

THE MAJOR

The major requirements are included in the minimum total of thirty-two courses listed under general requirements and departmental requirements. The following specific courses must be included: Biomedical Engineering 101, 110, 132, 163, and 164.

Civil and Environmental Engineering (CE)

Professor Melosh, *Chairman*; Professor Utku, *Director of Undergraduate Studies*; Professors Muga, Vesilind, and J. F. Wilson; Associate Professors Biswas, Medina, Peirce, and Petroski; Assistant Professors Arges, Marin, Pas, and Reckhow; Adjunct Professor Saibel; Visiting Associate Professor Sallfors

Civil engineering involves the conception, design, analysis, and building of constructed facilities. Modern civil engineers may find themselves engaged in such

complex problems as safety of power plants, environmental planning for a community, designing an interplanetary vehicle, or optimizing an urban transportation system. There are seven major speciality areas of civil engineering at Duke. Environmental engineering deals with the quality of human environment as affected by water supply and wastewater treatment and disposal. Geotechnical engineering is concerned with interaction between engineering structures and the earth's crust as well as with structures constructed of earth as a material. Mechanics and materials engineering is the study of the behavior of materials under various conditions of loading and environment. Ocean engineering deals with the development and use of marine resources. Structural engineering is concerned with economical and safe design of engineering structures. Urban engineering encompasses a broad spectrum of integrated technological problems such as land and city planning and development, mass transportation, and public health and safety. Water resources engineering is concerned with the usage, preservation, and replenishment of water resources. In addition, a student may elect a general program of civil engineering studies. The student may also pursue a degree with a double major in civil engineering and the policy sciences, by additionally satisfying the requirements of the Department of Public Policy Studies.

The civil engineering program at Duke is supported by several laboratories for instruction and research. The structural engineering laboratory has universal testing machines with capacities to 400,000 pounds; hardness testers; and machines for testing torsion, fatigue, and impact. The department has facilities for the construction and testing of structural models, including medium-speed electronic equipment for the measurement and recording of strains and displacements. The soil mechanics laboratory includes modern testing equipment and instruments, such as static and dynamic and model testing accessories, as well as a triaxial shear apparatus, designed for testing soil and rock at confining pressures up to 100,000 pounds per square inch. The fluid mechanics laboratory equipment includes a water wave flume with paddle-type variable frequency, constant amplitude, wave generator, and a variety of sensors. The sanitary engineering laboratory is equipped for determining the characterization of waters and wastewaters and for applying biological, chemical, and physical treatment methods to improve their quality. The materials laboratory deals with the physical properties and stress-deformation characteristics of bituminous mixtures and concretes. The department has a representative collection of modern surveying equipment.

16. Surveying for Engineers. The theory and application of measurements required for planning, design, and construction of engineered facilities. Transit-tape, electronic distance measurement, and stadia surveys; differential and profile leveling; traverse computations; topographic mapping. Laboratory included. Prerequisite: Mathematics 19 or equivalent. Half course. *Arges*

116. Transportation Engineering. The role and history of transportation. Introduction to the planning and design of links, vehicles, and terminals of all transportation modes. Principles of traffic engineering and route location and design. Planning studies and economic evaluation. Prerequisites: junior or senior standing and consent of instructor for nonengineering students. One course. *Pas*

122. Fluid Mechanics. Physical properties of fluids; fluid-flow concepts and basic equations; continuity, energy, and momentum principles; dimensional analysis and dynamic similitude; viscous effects; applications emphasizing real fluids. Selected laboratory work. Corequisite: Engineering 123. One course. *Medina or Muga*

123. Water Resources Engineering. Descriptive and quantitative hydrology, hydraulics of pressure conduits and measurement of flow, compound pipe

systems, analysis of flow in pressure distribution systems, open channel flow, reservoirs and distribution system storage. Groundwater hydrology and well-hydraulics. Probability and statistics in water resources. Selected laboratory and field exercises, computer applications. Prerequisite: Civil Engineering 122. One course. *Medina or Muga*

124. Environmental Engineering. Qualitative and quantitative physical, chemical, and bacteriological characterization of water and wastewater. Introduction to water treatment processes and wastewater collection, treatment and disposal systems. Air pollution control; solid and hazardous waste management. Laboratory included. Field trips to be arranged. Prerequisite: Civil Engineering 123. One course. *Vesilind*

127. Environmental Pollution Control. A study of the environmental causes and effects of air, land, and water pollution. Interactions between the environment and stresses to which it is subjected as a consequence of growth and concentration of populations and their increasing demands on natural resources. Solid waste, recycling, noise pollution, and environmental ethics. Not open to engineering majors. Prerequisite: junior or senior standing. One course. *Peirce or Vesilind*

131. Theory of Structures. A first course in the application of mechanics to the analysis of plane and space structures; a unified treatment of statically determinate and indeterminate structural systems. Prerequisites: Mathematics 103 and Engineering 75. One course. *Arges*

133. Structural Design I. Nonhomogenous materials. Determination of physical and mechanical properties of construction materials. Theory and design of compression and flexural members. Emphasis on ultimate strength theory for concrete. Timber design using mechanical fasteners. Laboratory exercises include concrete aggregate evaluation, concrete mix design, and structural timber tests. Prerequisite: Civil Engineering 131. One course. *Biswas*

134. Structural Design II. Design in metals, primarily steel. Properties of materials as criteria for failure. Tension, compression, and flexural members. Bolted and welded connections, including eccentric connections. Built-up members. Design by elastic and plastic methods. Selected problems to include computations and drawings. Prerequisite: Civil Engineering 131. One course. *Melosh*

139. Introduction to Soil Mechanics. Origin and composition of soils, soil structure. Flow of water through soils; capillary and osmotic phenomena. Soil behavior under stress; compressibility, shear strength. Elements of mechanics of soil masses with application to problems of bearing capacity of foundations, earth pressure on retaining walls, and stability of slopes. Laboratory included. Prerequisite: Civil Engineering 122. One course. *Sallfors*

141, 142. Special Topics in Civil Engineering. Study arranged on a special topic in which the instructor has particular interest and competence as a result of research and professional activities. Prerequisites: consent of instructor and Director of Undergraduate Studies. Half course or one course each. *Staff*

146. Professional Engineering. A study of general topics related to the professional practice of engineering with emphasis on economic and legal aspects. Monetary basis for engineering decisions, economic alternatives; contracts, specifications, ethics; scheduling by the Critical Path Method. Presentation of student papers on current or unique engineering topics. Prerequisite: junior or senior standing in engineering. One course. *Staff*

197, 198. Projects in Civil Engineering. These courses may be taken by junior and senior engineering students who have demonstrated aptitude for independent work. Prerequisites: consent of instructor and Director of Undergraduate Studies. Half course or one course each. *Staff*

201. Advanced Mechanics of Solids. Tensor fields and index notation. Analysis of states of stress and strain. Conservation laws and field equations. Constitutive equations for elastic, viscoelastic, and elastic-plastic solids. Formulation and solution of simple problems in elasticity, viscoelasticity, and plasticity. One course. *Petroski*

204. Plates and Shells. Differential equation and extremum formulations of linear equilibrium problems of Kirchhoffian and non-Kirchhoffian plates of isotropic and orthotropic material. Solution methods. Differential equation formulation of thin shell problems in curvilinear coordinates; membrane and bending theories; specialization for shallow shells, shells of revolution, and plates. Extremum formulation of shell problems. Solution methods. Prerequisites: Mathematics 111 and Engineering 75 or 135. One course. *Utku*

205. Elasticity. Introduction to linear theory of elasticity. Constitutive equations for anisotropic and isotropic elastic solids. Formulation and solution of torsion, bending, and plane problems by semi-inverse, complex potential, and variational methods. Three-dimensional problems. Prerequisite: Civil Engineering 201 or equivalent. One course. *Petroski*

212. Mechanical Behavior of Materials. Historical perspective on structural failure. Fracture mechanics and its application to brittle and ductile fracture, and fatigue in structural materials. Analysis of load spectra; fatigue crack growth calculations. One course. *Petroski*

215. Urban and Regional Systems Analysis. Identification, formulation, and solution of urban and regional systems problems. Models of population growth and distribution, spatial activity allocation models. Design and analysis of experiments for resource recovery, waste disposal, and transportation planning. Application of matrix algebra in the design and analysis of solid waste processing and resource recovery. Optimization of public service delivery systems, including solid waste collection and disposal, resource recovery, water supply systems, and transportation networks. Prerequisite: senior standing. One course. *Pas*

216. Transportation Planning and Policy Analysis. Issues in policy planning and decision making in urban and rural transportation systems. Transportation legislation. Public transportation alternatives with emphasis on public transit and paratransit solutions. Prerequisite or corequisite: Civil Engineering 116 or consent of instructor. C-L: Public Policy Sciences 254. One course. *Pas*

217. Transportation Systems Analysis. The transportation systems planning process. Quantitative analysis; mathematical modeling and computer simulation techniques for short-and long-range planning and evaluation of transportation systems. Prerequisite or corequisite: Civil Engineering 116. One course. *Pas*

218. Engineering Management and Project Evaluation. Statistical analysis and economics. Data organization, distributions, estimates of parameters, hypothesis testing, analysis of variance. Economic impact assessment, supply and demand forecasting, benefit/cost analysis, economic incentives, public and private finance, input/output analysis. Fulfills advanced technical elective for mechanical engineering majors. Prerequisite: senior standing in engineering. One course. *Peirce*

225. Dynamic Engineering Hydrology. Dynamics of the occurrence, circulation, and distribution of water; hydrometeorology, geophysical fluid motions. Precipitation, surface runoff and stream flow, infiltration, water losses. Hydrograph analysis, catchment characteristics, hydrologic instrumentation, and computer simulation models. Prerequisite: Civil Engineering 122 or consent of instructor. One course. *Medina or Muga*

232. Reinforced Concrete Design. A critical review of research related to the development of existing codes. Special attention is given to the consideration of

temperature change effects, shrinkage, plastic flow, bond, and shear and diagonal tension. Two-way slab and flat plate design. Prerequisite: Civil Engineering 133. One course. *Biswas*

233. Prestressed Concrete Design. A critical review of research and recent developments in prestressed concrete design. Prestressed tanks, beams, and columns; partial prestressing and composite design. Prerequisite: Civil Engineering 133. One course. *Biswas*

235. Foundation Engineering. An introduction to methods of analysis, design, and construction of foundations. Bearing capacity and settlement of shallow and deep foundations. Soil exploration, excavation and bracing, drainage and stabilization, and underpinning. Foundation vibrations. One course. *Sallfors*

239. Physical Properties of Soils. Origin of soils, soil minerals, and processes of soil formation; physical chemistry of multiphase systems and soil structure. Permeability and flow of water through soils, capillary and osmotic phenomena, soil compressibility, theory of consolidation, shear strength and failure criteria. Stress-strain relationships, volume changes, and pore pressure during shear strength properties. Advanced laboratory soil testing techniques. One course. *Staff*

241. Environmental Engineering Chemistry and Biology. Inorganic and organic chemistry including equilibrium concepts as applied to water and wastewater treatment. Basic biology and ecology of natural, polluted, and wastewater treatment systems. Concepts of metabolism, enzyme kinetics, and growth kinetics are stressed. Occasional laboratories to illustrate analytical methods and types of organisms in the environment. Prerequisite: Civil Engineering 124. One course. *Staff*

243. Unit Operations in Water Treatment. Fundamental bases for design of water and waste treatment systems, including transport, mixing, sedimentation and filtration, gas transfer, coagulation, and biotreatment processes. Prerequisite: Civil Engineering 124 or consent of instructor. One course. *Vesilind*

245. Pollutant Transport Systems. Distribution of pollutants in natural waters and the atmosphere; diffusive and advective transport phenomena within the natural environment and through artificial conduits and storage/treatment systems. Analytical and numerical prediction methods. Prerequisites: Civil Engineering 122 and Mathematics 111 or equivalents. One course. *Medina*

246. Water Supply Engineering Design. The study of water resources and municipal water requirements including reservoirs, transmission, treatment and distribution systems; methods of collection, treatment, and disposal of municipal and industrial wastewaters. The course includes the preparation of a comprehensive engineering report encompassing all aspects of municipal water and wastewater systems. Field trips to be arranged. Prerequisite: Civil Engineering 124 or consent of instructor. One course. *Vesilind*

248. Solid Waste and Resource Recovery Engineering. Engineering design of resource recovery systems including traditional and advanced technologies. Sanitary landfills and incineration of solid wastes. Energy recovery and recycling processes. Application of systems analysis to collection of municipal refuse. Collection, treatment, and disposal of solid wastes from wastewater treatment. Prerequisite: Civil Engineering 124 or consent of instructor. One course. *Vesilind*

249. Control of Hazardous and Toxic Waste. Solutions to industrial and municipal hazardous waste management problems. Handling, transportation, processing, storage and disposal technologies. Upgrading an abandoned disposal site. Economic and regulatory aspects. Case studies. Prerequisites: senior standing

in engineering or natural sciences and consent of instructor. Fall semester. One course. *Peirce*

251. Systematic Engineering Analysis. Mathematical formulation and numerical analysis of discrete engineering systems with emphasis on theory of structures. Equilibrium and propagation problems in continuum; properties of these systems and their discretization by the trial functions with undetermined parameters. The use of weighted residual methods, finite elements, and finite differences. Prerequisite: senior or graduate standing. One course. *Utku*

254. Applications of Finite Element Analysis. Theory of element and material models; models of metals, rock, reinforced concrete, wood, glass, soil, water, and air; analyses of torsion members, shear walls, membranes, plates, shells, solids, and compound structural systems; analysis of soil-structure and fluid-structure systems; prediction of field heating, seepage, and pollution. Prerequisite: Civil Engineering 251 or consent of instructor. One course. *Melosh*

258. Analysis of Nonlinear Behavior of Structures. Computation of nonlinear response by discretization; models for simulation of geometric, material, and boundary constraint nonlinearities; analysis of limit loads, bifurcations, and snap-through; simulation of super-elastic, plastic, visco-elastic, and slipping materials; prediction of collapsing, ballooning, gapping, metal forming, and welding behavior. Prerequisite: Civil Engineering 251 or consent of instructor. One course. *Melosh or Utku*

265. Advanced Topics in Civil Engineering. Opportunity for study of advanced subjects relating to programs within the civil engineering department tailored to fit the requirements of a small group. One course. *Staff*

280. Engineering Aspects of Physical Oceanography. Study of the dynamic ocean processes of concern to the design engineer. Hydrometeorology, surface wind distribution, mechanics of generation and propagation of surface water waves, theory of periodic waves (linear and nonlinear), wave spectral descriptive models, astronomical tides, storm surge, impulsively generated waves (tsunamis), and wind- and wave-induced forces on various obstructions. Attention is focused on hindcasting-forecasting techniques and selection of design (wave spectra) criteria in terms of specified risk levels. Prerequisite: senior or graduate standing in engineering or the physical sciences. One course. *Muga*

281. Experimental System Engineering. Formulation of experiments; Pi theorem and principles of similitude; data acquisition systems; static and dynamic measurement of displacement, force, and strain; interfacing experiments with digital computers for statistical data analysis; students select, design, perform, and interpret laboratory-scale experiments in areas of fluid systems including environmental and ocean engineering; and in solid systems including structural and basic material behavior. Prerequisite: senior or graduate standing in engineering or the physical sciences. One course. *J. F. Wilson*

282. Port, Harbor, and Coastal Engineering. An intensive study of the various types of marine and coastal structures and their functions. Procedures for developing preliminary design alternatives and final design selection will be illustrated via the case history approach. Structures to be considered include piers (solid and open faced), seawalls and bulkheads, breakwaters, jetties, groins, outfalls, pipelines, moored cable array systems, and floating terminals. Each case history will be followed from conception and initial planning through the design stage to construction and postproject evaluation. Normally, there will be an opportunity to participate in an ongoing project. Prerequisite: Civil Engineering 280. One course. *Muga*

283. Ocean System Dynamics. Formulation of dynamic models for discrete and continuous structures, normal mode analysis, deterministic and stochastic

responses to shocks and environmental loading (earthquakes, winds, and waves), introduction to nonlinear dynamic systems, analysis and stability of structural components (beams and cables and large systems such as offshore towers, moored ships, and floating platforms). One course. *J. F. Wilson*

COURSES CURRENTLY UNSCHEDULED

- 202. Advanced Mechanics of Solids II**
- 226. Operational Hydrology**
- 234. Advanced Structural Design in Metals**
- 236. Earth Structures**
- 238. Rock Mechanics**
- 247. Air Pollution Control**

THE MAJOR

The major requirements are included in the minimum total of thirty-two courses listed under the general requirements and departmental requirements. Specific courses which must be included are: Engineering 11 (half course), 24, 51, 75, 83, 123; Civil Engineering 16 (half course), 116, 122, 123, 131, 133, 134, and 139.

Electrical Engineering (EE)

Professor Casey, *Chairman*; Associate Professor Hacker, *Director of Undergraduate Studies*; Professors Fair, Joines, Kerr, Marinos, Nolte, Owen, Pilkington, Wang, and T. G. Wilson; Associate Professor Trivedi; Assistant Professors Burton, Carroll, and George; Adjunct Assistant Professors Huffman, Pitt, Rafal, and Strole; Visiting Professor Trickey

Electrical engineering is a broadly based discipline dealing with the processing, control, and transmission of information and energy by making use of electrical and electromagnetic phenomena.

The flexibility of the electrical engineering curriculum permits a student to concentrate in such areas as computer engineering and digital systems, control systems, electronic circuits and microelectronics, signal processing and communications, and electromagnetic fields and microwaves. A student may also plan a double-major program with secondary concentration in such fields as computer science, biomedical engineering, physics, mathematics, history, public policy studies, and many others. Students with interests such as premedicine, prelaw, economics, art, music, psychology, and social systems can be accommodated within the curriculum through individually designed programs.

The various teaching and research laboratories in the department provide opportunities for laboratory and project work in areas such as electronics, digital systems, microelectronics and microprocessors, signal analysis and adaptive signal processing, power electronics, microwaves and microwave-matter interactions, and solid-state properties of materials. These laboratories are important to the undergraduate program since they permit students to become actively acquainted with the devices and techniques of modern electrical engineering through regularly scheduled experiments, independent projects, and occasionally, part-time assistance to faculty members engaged in research.

11, 12. Undergraduate Research in Electrical Engineering. An elective program in which undergraduate students participate in an ongoing program of research with electrical engineering faculty members. The research topic to be pursued by the student must be discussed with, and approved by, the faculty

member who is to serve as the research supervisor prior to registration for the course. For freshmen only. Quarter course each. *Staff*

51, 52. Undergraduate Research in Electrical Engineering. For sophomores only. See Electrical Engineering 11, 12. Quarter course each. *Staff*

61. Introductory Circuits and Systems. Circuit principles for linear and nonlinear networks, common signal waveforms, natural and forced response of linear circuits. Circuits in the AC steady state. One-port and two-port network theorems, transfer functions, block diagrams, feedback. Semiconductor diodes, transistors, and integrated circuits. Prerequisites: Mathematics 32 and Physics 51. Fall and spring semesters. One course. *Staff*

62. Introductory Electronics and Energy Conversion. Amplifiers: biasing circuits, large-signal diode and transistor models, small-signal multistage and feedback amplifiers. Operational amplifiers and analog computers. Energy conversion via magnetic fields and circuits. Transformers, DC and AC machines, instrumentation, and automatic control. Prerequisite: Electrical Engineering 61. Spring semester. One course. *Staff*

101, 102. Undergraduate Research in Electrical Engineering. For juniors only. See Electrical Engineering 11, 12. Quarter course or half course each. *Staff*

103. Introduction to Nonlinear Network Theory. Introduction to theory and techniques for analysis and synthesis of nonlinear circuits. Characterization of 2-, 3-, and n-terminal nonlinear network elements. Laws for interconnecting elements and determining equilibrium equations. Operating points, driving-point and transfer-characteristic plots. Graphical and numerical analysis and synthesis of DC and AC nonlinear resistive functional networks. Nonautonomous first-order nonlinear networks, and autonomous second-order nonlinear networks. Some laboratory and computer simulations. Prerequisite: Electrical Engineering 61. Fall semester. One course. *Owen or T. G. Wilson*

112. Operational Methods in Electrical Engineering. Fourier series and transforms; spectral analysis applied to networks and modulation systems. Laplace transforms and transient response of systems; transfer functions, poles and zeros, stability. Z-transforms and discrete-time systems, waveform sampling and digital signal filtering, digital simulation of analog systems. Probabilistic signal models, continuous and discrete random variables and their distributions, uniform band-limited Gaussian noise, probabilistic model of a band-limited communication channel. Prerequisite: Electrical Engineering 61. Spring semester. One course. *Kerr*

132. Statistical and Computational Methods in Signal Processing. Introduction to fundamental concepts of signal processing for both deterministic and random discrete-time signals in noise. Difference equations, sampling theorem, Z-transforms, and spectral analysis. Detection and estimation of signals in noise. Some computer simulations. Prerequisite: Mathematics 135. C-L: Biomedical Engineering 132. Spring semester. One course. *Nolte*

143. Introduction to Electromagnetic Fields. Review of vector analysis. Introduction to Maxwell's equations. Electrostatic and magnetostatic fields and their sources. Electromagnetic power, energy, and the Poynting theorem. Prerequisites: Mathematics 104 or 111 and Physics 52. Spring semester. One course. *Hacker or Joines*

151, 152. Undergraduate Research in Electrical Engineering. For seniors only. See Electrical Engineering 11, 12. Quarter course or half course each. *Staff*

155, 156. Special Topics in Electrical Engineering. Study of selected topics in electrical engineering tailored to fit the requirements of a small group. Prerequisites: consent of instructor and Director of Undergraduate Studies. Half course or one course each. *Staff*

157. Introduction to Switching and Automata Theory. This course introduces techniques for the analysis and design of combinational and sequential networks. Discrete mathematical systems, elements of code theory, threshold logic, functional decomposition, minimum-complexity combinational and sequential networks, asynchronous and clocked sequential systems, iterative switching structures, Turing machines, fault diagnosis techniques. Selected laboratory work. Usually open to juniors and seniors. C-L: Computer Science 157. Fall semester. One course. *Carroll or Strole*

161. Electronic Circuits. Graphical and mathematical modeling of electronic devices such as diodes, and bipolar-junction and field-effect transistors; techniques for the analysis and design of electronic circuits with emphasis on large-signal and small-signal methods; applications of these methods to particular circuits, including regulators, bias-point stability, amplifiers, and switching circuits; computer simulation of electronic circuits using SPICE. Three class sessions and one computation or laboratory session. Prerequisite: Electrical Engineering 112. One course. *George or Owen*

164. Electromagnetic Fields and Waves. Discussion of plane waves in insulating and conducting media. Reflection and refraction of plane waves. Transmission lines and waveguides for practical applications. Introduction to radiation and antennas. Prerequisite: Electrical Engineering 143. Fall semester. One course. *Hacker or Joines*

173, 174. Projects in Electrical Engineering. A course which may be undertaken only by seniors who are enrolled in the graduation with distinction program or who show special aptitude for individual project work. Prerequisite: consent of Director of Undergraduate Studies. Elective for electrical engineering majors. Half course to two courses each. *Staff*

185. Pulse and Digital Electronics. Generation and shaping of waveforms encountered in information processing systems, such as radar, computer, control, and instrumentation systems. Typical circuit functions included are linear and nonlinear wave shaping, pulse and time-base generation, time delay, counting, and gating. Emphasis on the application of semiconductor devices to the realization of circuit functions. Three class sessions and one computation or laboratory session. Prerequisite: Electrical Engineering 161. Spring semester. One course. *George*

186. Introduction to Electronic Communications. Spectral analysis and sampling of analog signals. Noise sources, narrow-band noise models, noise temperature of antennas and amplifiers. Information capacity of noisy channels. Compact codes; error detecting and correcting codes. AM, FM, pulse, and digital modulation and detection systems. Pulse code detection and matched filters. Examples from commercial broadcasting and television, Bell T-carrier, deep-space telemetry, and optical fiber communications. Prerequisites: Electrical Engineering 62 and 112 or equivalents. Spring semester. One course. *Kerr, Nolte, or Owen*

196. Microwave Electronic Circuits. Microwave circuit analysis and design techniques. Properties of planar transmission lines for integrated circuits. Matrix and computer-aided methods for analysis and design of circuit components. Analysis and design of input, output, and interstage networks for microwave transistor amplifiers and oscillators. Prerequisite: Electrical Engineering 161 or equivalent. Spring semester. One course. *Joines*

199. Linear Control Systems. Analysis and design of feedback control systems. Block diagram and signal flow graph system models. Servomechanism

characteristics, steady state errors, sensitivity to parameter variations and disturbance signals. Time domain performance specifications. Stability. Root locus, Nyquist, and Bode analysis; design of compensation circuits; closed loop frequency response determination. Introduction to time domain analysis and design. Prerequisite: Electrical Engineering 112 or consent of instructor. One course. *Kerr or T. G. Wilson*

203. Random Signals and Noise. Introduction to mathematical methods of describing and analyzing random signals and noise. Review of basic probability theory; joint, conditional, and marginal distributions; random processes. Time and ensemble averages, correlation, and power spectra. Optimum linear smoothing and predicting filters. Introduction to optimum signal detection and parameter estimation. One course. *Kerr, Nolte, or Wang*

204. Computer Network Architecture. The architecture of computer communication networks and the hardware and software required to implement the protocols that define the architecture. Basic communication theory, transmission technology, private and common carrier facilities. Addressing structures and error recovery. Multivendor software compatibility. Economic tradeoffs. International standards. Prerequisites: Computer Science 154 and Electrical Engineering 157. C-L: Computer Science 204. One course. *Pitt*

205. Signal Detection and Extraction Theory. Introduction to signal detection and information extraction theory from a statistical decision theory viewpoint. Subject areas covered within the context of a digital environment are decision theory, detection, and estimation of known and random signals in noise, estimation of parameters and adaptive recursive digital filtering, and decision processes with finite memory. Applications to problems in communication theory. Prerequisite: Electrical Engineering 203 or consent of instructor. One course. *Nolte*

206. Digital Signal Processing. Introduction to the fundamentals of processing signals by digital techniques with applications to practical problems. Discrete time signals and systems, elements of the Z-transform, discrete Fourier transforms, digital filter design techniques, fast Fourier transforms, and discrete random signals. One course. *Nolte*

207. Fault-Tolerant Computer Systems. Test generation and diagnostic program development for detection and location of faults in digital networks, digital simulation as a diagnostic tool for test generation and verification of the initial system design, design of self-checking and fault-tolerant systems, and effectiveness evaluation of various fault-tolerant schemes. Fall semester. C-L: Computer Science 207. One course. *Marinos*

208. Digital Computer Design. Hardware implementation of combinational and sequential switching networks. Arithmetic elements, switching matrices, character generators, counters, and shift registers. Detailed design and simulation of a general-purpose computer system. Computer architectures based on macromodules, hardware compiler implementations, and parallel processing concepts are also discussed. Prerequisite: Electrical Engineering 157 or consent of instructor. C-L: Computer Science 208. One course. *Marinos*

209. Microprocessor Fundamentals and Applications. Various state-of-the-art microprocessor chips and their associated instruction sets; microcomputer architectures; comparative study of various microprocessor designs; microprocessor-based system design illustrated by several carefully selected design projects. Prerequisites: Electrical Engineering 157 and consent of instructor. Fall semester. C-L: Computer Science 209. One course. *Marinos*

210. Introduction to VLSI Systems. A study of devices, circuits, fabrication technology, logic design techniques, and system architecture intended to provide

the student with an understanding of the underlying physics and design techniques of VLSI systems. Students are required to complete the design of a digital subsystem in NMOS. Prerequisites: Electrical Engineering 157 and 216 or consent of instructor. Spring semester. One course. *Carroll*

211. Quantum Mechanics. Wave mechanics and elementary applications, free particle motion, Schrödinger equation, approximation methods. Fall semester. One course. *Staff*

213. Modern Optics. Optical processes including the propagation of light, coherence, interference, and diffraction. Consideration of the optical properties of solids with applications of these concepts to lasers and modern optical devices. C-L: Physics 185. One course. *Guenther or Hacker*

214. Introduction to Solid-State Physics. Discussion of solid-state phenomena including crystalline structures, thermal properties, free electron theory of metals, and band theory of semiconductors with emphasis on understanding the electrical, magnetic, and optical properties of solids. C-L: Physics 214. One course. *Hacker*

215. Semiconductor Physics. A quantitative treatment of the physical processes that underlie semiconductor device operation. Topics include band theory and conduction phenomena; equilibrium and nonequilibrium charge carrier distributions; charge generation, injection, and recombination; drift and diffusion processes. Prerequisite: Electrical Engineering 211 or consent of instructor. One course. *Hacker or Casey*

216. Devices and Processing for Integrated Circuits. Basic operating concepts of the devices that are used in integrated circuits: Schottky-barriers, ohmic contacts, p-n junctions, bipolar transistors, and Si MOS capacitors and field-effect transistors. Device fabrication and processing will also be presented. Selected laboratory work. Fall semester. One course. *Casey*

218. Integrated Circuit Engineering. Basic processing techniques and layout technology for integrated circuits. Photolithography, diffusion, oxidation, ion implantation, and metallization. Design, fabrication, and testing of integrated circuits. Prerequisite: Electrical Engineering 216. One course. *Casey or Fair*

224. Advanced Electronic Circuits. Application of discrete and integrated circuits in analog systems. A study of differential, operational, and other multistage amplifiers; frequency response, feedback, compensation techniques, and other topics. Some laboratory and computer simulation work. Prerequisite: Electrical Engineering 161 or equivalent. One course. *George*

234. Power Electronics: High-Power Circuits. Basic principles of analysis and design of electronic power control and conversion circuits with particular emphasis on thyristor (SCRs, TRIACs, etc.) circuits. Characteristics of high-power semiconductors, commutating circuits, AC voltage controllers, AC-to-AC controlled rectifiers, DC-to-DC converters, DC-to-AC inverters, AC-to-AC converters. Laboratory. Prerequisite: Electrical Engineering 161 or equivalent. One course. *Owen and T. G. Wilson*

235. Nonlinear Magnetic and Semiconductor Power Converters: Design and Control I. Engineering properties of modern soft magnetic materials. Mathematical descriptions of nonlinear magnetic and semiconductor characteristics for transient and steady-state analysis of power electronic circuits. Design of saturable and nonsaturating magnetic devices. State-plane analysis of negative-resistance oscillators and self-oscillating DC-to-DC inverters. Considerations of starting problems, semiconductor switching losses, magnetic core losses, and efficiency. Laboratory. Prerequisites: Electrical Engineering 161 or equivalent and consent of instructor. One course. *Owen and T. G. Wilson*

236. Nonlinear Magnetic and Semiconductor Power Converters: Design and Control II. Analysis, design, and control of electronic DC-to-DC power converters utilizing energy storage principles. Optimum configurations, stability, losses, large-signal and small-signal dynamic response, measurement techniques. Special attention given to design of pulse-modulated controllers using state-space and frequency-response techniques. Laboratory. Prerequisite: Electrical Engineering 235. One course. *Owen and T. G. Wilson*

237, 238. Advanced Power Electronics Laboratory and Seminar. Experiments related to the design, control, measurement, and application of power electronic circuits and systems. Prerequisite: consent of instructor. Two courses. *Owen and T. G. Wilson*

241. Linear Systems. Modeling of multiple input-output linear systems in the frequency and time domain. Matrix differential and difference equations and their solutions; state variables. Digital simulation of differential systems. Fourier analysis of signals and systems. Transform techniques applied to state variable models. State-space models of distributed systems. One course. *Kerr or Wang*

242. Modern Control and Dynamic Systems. C-L: Mechanical Engineering 230. One course. *Garg or Wright*

250. Introduction to Robotics. Fundamental notions in robotics, basic configurations of manipulator arm designs, coordinate transformations, control of robot actions, robot programming, artificial intelligence; machine vision, force, touch, and other sensory systems; selected laboratory assignments. Prerequisites: Electrical Engineering 112 and consent of instructor. One course. *Wang*

251. Pattern Classification and Recognition. Parameter estimation and supervised learning, nonparametric techniques, linear discriminant functions, clustering, language theory related to pattern recognition, examples from areas such as character and severe weather recognition, classification of community health data, recognition of geometrical configurations, algorithms for recognizing low resolution touch-sensor array signatures and 3-D objects. Prerequisite: consent of instructor. One course. *Wang*

252. Computer Systems Organization. C-L: Computer Science 252. One course. *Trivedi*

265. Advanced Topics in Electrical Engineering. Opportunity for study of advanced subjects related to programs within the electrical engineering department tailored to fit the requirements of a small group. Prerequisites: approval of Director of Undergraduate Studies and of supervising instructor. One course. *Staff*

271. Electromagnetic Theory. The classical theory of Maxwell's equations; electrostatics, magnetostatics, boundary value problems including numerical solutions, currents and their interactions, and force and energy relations. Three class sessions. Prerequisite: consent of instructor. One course. *Hacker or Joines*

272. Electromagnetic Communication Systems. Review of fundamental laws of Maxwell, Gauss, Ampere, and Faraday. Elements of waveguide propagation and antenna radiation. Analysis of antenna arrays by images. Determination of gain, loss, and noise temperature parameters for terrestrial and satellite electromagnetic communication systems. Prerequisite: Electrical Engineering 164 or 271. Spring semester. One course. *Joines*

COURSES CURRENTLY UNSCHEDULED

162. Electromechanical Energy Conversion

188. Electrical Energy Systems

- 202. System Modeling and Computation
- 217. Lasers
- 222. Nonlinear Analysis
- 226. Modeling and Computer-aided Analysis of Electronic Systems
- 227. Network Synthesis
- 243. Advanced Linear Systems Theory

THE MAJOR

The major requirements are included in the minimum total of thirty-two courses listed under the general requirements and departmental requirements. The electrical engineering department requires the equivalent of four engineering design and eight engineering science courses. A list of the engineering design and engineering science content of all engineering courses may be obtained at the departmental office.

Mechanical Engineering and Materials Science (ME)

Professor Chaddock, *Chairman*; Professor Garg, *Director of Undergraduate Studies*; Professors Cocks, Harman, Pearsall, and Shepard; Associate Professors Elsevier, Jones, Loendorf, Quinlan, Shaughnessy, and Wright; Assistant Professors Buzzard, Cadien, and Hight; Adjunct Associate Professor Sud

In a modern technological society the profession of mechanical engineering has a three-fold role. The first and traditional role is the production of devices and machines. The products are as varied as the needs of people, from a mechanical toothpaste tube filler to a hydraulic turbine for harnessing tidal power or a home heating system powered by solar energy. The second role has gradually evolved from the first, and now encompasses in-depth technical analyses and the design of complex engineering systems. Examples are nuclear power stations and ocean habitats for undersea exploration. The third role involves the relationship between technological change and human social, biological, and physical environment. It is no longer adequate to consider only obvious benefits and immediate costs; engineering solutions must be related to society's nontechnical needs and problems. If an educational program is to provide engineering leaders, it must respond to these broadening roles.

Historically, the available materials have limited the technological development of any age. The development of materials with particular combinations of mechanical, chemical, and electrical properties continues as a limiting step for technological advances on almost every engineering frontier. An especially crucial area requiring the skills of materials scientists and engineers is that of energy conversion. Needs exist not only in the overall production, distribution, and use of energy itself, but also in the development of less energy-consuming processes for the production of materials.

The undergraduate curriculum in mechanical engineering and materials science provides a broad base in the basic sciences and mathematics, engineering and materials sciences, analog and digital computation, mechanical design, systems theory, and computer-aided engineering which includes computer-assisted analysis, synthesis, and manufacturing. The search for solutions to society's problems also requires an engineer to interact with other professions and disciplines; to reach out for an understanding of the economic, social, health, and political consequences of engineering decisions. Elective opportunities in the social sciences, life sciences, and humanities help fill this need.

Undergraduate laboratories provide unique learning experiences and assist in the development of professional attitudes and approaches to typical engineering

problems. In the dynamics of machines laboratory, fundamentals of instrumentation and dynamic responses are introduced through simulation techniques. The materials laboratory has equipment for the synthesis and evaluation of metals, polymers, ceramics, and biomaterials. Experiments in the fluid mechanics and heat transfer laboratories relate velocity and temperature field measurements to fluid friction and heat exchange processes. In the computer-aided engineering laboratory, students learn and apply interactive computational procedures in support of geometric model definition and its graphical display. Advanced design students use the laboratory for projects which require the use of data base management concepts in support of interactive analysis and design methods.

Involvement with mechanical engineering and materials science goes beyond any specific technology, device, or system. Based on the curriculum, students experience the ways in which scientific knowledge can be utilized in the design and development of useful devices and processes. With the curriculum flexibility and the variety of course offerings, students can choose courses of study most suited to their aptitudes.

Students wishing to meet the requirements for graduation with distinction in mechanical engineering and materials science must satisfy the requirements specified in this bulletin under the section on honors. Additionally, the student must successfully complete a 200-level course in an area related generally with the central focus of the project. The 200-level course may be taken prior to, concurrent with, or subsequent to the work of the special project.

11, 12. Undergraduate Research in Mechanical Engineering. An elective program in which undergraduate students participate in an ongoing program of research with mechanical engineering faculty members. The research topic pursued by the student is arranged by mutual agreement between the student and the participating faculty member. For freshmen only. Quarter course each. *Staff*

102. Thermodynamics II. Review of the laws of thermodynamics and their relation to energy conversion. Statistical concepts of the second law. Properties of real gases, gas mixtures, and solids. Generalized thermodynamic relationships. Combustion, thermochemistry, and chemical equilibrium. Applications to combustion power cycles, propulsion, and heat pumping. Prerequisite: Engineering 101. One course. *Elsevier*

112. Polymer Science. Extension of the principles of Engineering 83 to high molecular weight polymers, especially those which have significant engineering applications; structure and properties of polymers; polymerization mechanisms; properties of commercial polymers; polymer processing. Prerequisite: Engineering 83. (Offered alternate spring semesters; next offering spring 1984.) One course. *Pearsall*

115. Failure Analysis and Prevention. A study and analysis of the causes of failure in engineering materials and the diagnosis of those causes. Elimination of failures through proper material selection, treatment, and use. Case histories. Examination of fracture surfaces. Laboratory investigations of different failure mechanisms. Prerequisites: Engineering 75 and 83 or consent of instructor. One course. *Jones, Cocks, Pearsall, or Shepard*

126. Fluid Mechanics. An introductory course emphasizing the application of the principles of conservation of mass, momentum, and energy to a fluid system. Physical properties of fluids, dimensional analysis and similitude, viscous effects and integral boundary layer theory, subsonic and supersonic flows, normal shock waves. Selected laboratory work. Corequisites: Engineering 101 and 123. One course. *Buzzard or Shaughnessy*

140. Dynamics of Machines. Analysis of machines and mechanical devices to determine the motions resulting from applied loads as well as inputs required to

produce specified motions; kinematic synthesis; study of vibrations in machinery; control of resonance, chatter, and noise. Prerequisites: Mathematics 111 and Engineering 123 and 130. One course. *Wright*

141. Mechanical Design. A study of the broad aspects of mechanical design starting with the creative process and considering the effects of economics, human factors, ethics, and prior art on design. Basic mechanical components such as gears, cams, bearings, springs, and shafts introduced in the discussions to promote familiarity with their design and application. Practice in the application of the design process through a term design project. Prerequisites: Mechanical Engineering 115 and 140. One course. *Hight, Loendorf, or Wright*

150. Heat and Mass Transfer. A rigorous development of the laws of mass and energy transport as applied to a continuum. Energy transfer by conduction, in laminar and turbulent flow inside and outside of tubes, and by radiation. Application to heat exchangers, thermal power equipment, and heat transfer in the environment. Introduction to the principles of molecular diffusion and convective mass transfer. Use of the analogies between mass, momentum, and energy transfer in problem solving. Selected laboratory work. Prerequisites: Mechanical Engineering 126 and Mathematics 111. One course. *Buzzard, Chaddock, or Harman*

153. Heating, Air Conditioning, and Refrigeration. Principles of thermodynamics, heat transfer, and fluid flow applied to comfort and industrial air conditioning. Cycles and equipment for heating, cooling, and humidity control. Air transmission and distribution. Modern vapor compression, absorption, and low temperature refrigeration cycles and systems. Prerequisite: Engineering 101. One course. *Elsevier*

165, 166. Special Topics in Mechanical Engineering. Study arranged on a special engineering topic in which the faculty has particular interest and competence as a result of research and professional activities. Prerequisites: consent of instructor and Director of Undergraduate Studies. Half course or one course each. *Staff*

183. Power Generation. Basic concepts of thermodynamics, heat transfer, and fluid flow applied to power generation processes. Nuclear reaction theory and reactor technology; fossil fuel combustion theory and modern boiler practice. Power plant ancillary equipment and processes. Design considerations and analyses include economic and environmental factors. One course. *Harman*

198. Projects in Mechanical Engineering. This course may be assigned by the Chairman of the department to outstanding seniors who express a desire for such work and who have shown aptitude for research in one distinct field of mechanical engineering. Prerequisites: *B* average and senior standing. Half course to two courses. *Staff*

202. Engineering Thermodynamics. General thermodynamic relationships and continuum properties of real substances. Availability and second law analysis of energy conversion processes. Low temperatures and the third law of thermodynamics. Reaction and multiphase equilibrium. Statistical thermodynamics of simple systems. One course. *Harman*

211. Theoretical and Applied Polymer Science. An advanced course in materials science and engineering dealing specifically with the structure and properties of polymers. Particular attention paid to recent developments in the processing and use of modern plastics and fibers. Product design considered in terms of polymer structures, processing techniques, and properties. One course. *Pearsall*

213. Advanced Materials Science. An in-depth study of current problems in materials applications conducted in a seminar format. Treatment will include

thermal, electrical, optical, and magnetic properties of materials in terms of basic physical concepts. Intended to provide materials scientists and engineers with a theoretical basis for understanding and manipulating properties. Prerequisites: Engineering 83 and Mechanical Engineering 111 or 112. One course. *Cadien, Cocks, or Shepard*

214. Corrosion and Corrosion Control. Environmental aspects of the design and utilization of modern engineering alloys. Theory and mechanisms of corrosion, particularly in seawater and atmospheric environments. Microstructural aspects of diffusion, oxidation, hot corrosion, and stress corrosion. Prerequisite: Engineering 83. One course. *Staff*

215. Biomedical Materials and Artificial Organs. C-L: Biomedical Engineering 215. One course. *Clark*

216. Materials Science and Solar Technology. All aspects of materials science as related to solar energy development. Emphasis is placed on photovoltaic materials and devices, including the relationship of conversion efficiency to material properties and solar cell design. One course. *Cocks*

217. Fracture of Engineering Materials. Conventional design concepts and their relationship to the occurrence of fracture. Linear elastic and general yield fracture mechanics. Microscopic plastic deformation and crack propagation. The relationship between macroscopic and microscopic aspects of fracture. Time dependent fracture. Fracture of specific materials. Prerequisites: Engineering 83 and Mechanical Engineering 115. One course. *Jones*

218. Thermodynamics and Thermokinetics of Materials. Thermodynamic and thermokinetic fundamentals and their application to materials problems such as alloying, solid solution formation, and mass transport. Topics covered include the laws of thermodynamics, reactions and reaction rates, Gibbs and Helmholtz free energy, chemical potential, phase equilibria in semiconductor and metallic systems, behavior of solutions, phase diagrams, activation energies, and the transport equations. One course. *Cadien, Cocks, Jones, Pearsall, or Shepard*

219. Applied Surface Science: Crystal Growth and Analytical Techniques. Fundamentals of surfaces processes and particle-surface interactions. Topics covered include adsorption, accommodation, elemental sticking coefficients, adatom diffusion, nucleation, thin film vapor phase growth (MBE, CVD, sputtering, etc.), and surface spectroscopies (AES, XPS, RBS, SIMS, etc.). One course. *Cadien*

221. Compressible Fluid Flow. Basic concepts of the flow of gases from the subsonic to the hypersonic regime. Effects of friction, heat transfer, and shock on one-dimensional inviscid flow. Potential theory, oblique shock waves, and special calculation techniques in two-dimensional flow. One course. *Harman or Shaughnessy*

222. Heat Transfer. Steady-state and transient solutions of the general heat conduction equation. Development of the equations for transport of energy by fluid motion. Principle of similarity and dimensional analysis in convective energy transport. Solutions of the boundary layer equations. The laws of radiation heat transfer and radiation heat exchange. One course. *Chaddock or Buzzard*

223. Principles and Design of Heat Transfer Equipment. Application of theoretical and experimental developments in heat transfer to the design of heat exchanges. Study of fin shapes, finned passages, fouling factors, baffling, and other parameters of heat exchanger design. Analytical and numerical methods for design calculation illustrated with equipment, such as furnaces, recuperators, regenerators, solar collectors, condensers, and evaporators. Prerequisite: Mechanical Engineering 150. One course. *Buzzard or Chaddock*

226. Intermediate Fluid Mechanics. A survey of the principal concepts and equations of fluid mechanics. Fluid properties. Statics. Basic equations for the control volume. The differential equations of fluid motion. Stream function. Irrotational flow. Navier-Stokes equations. Kelvin's and Crocco's theorems. Applications to two-dimensional incompressible potential flow and to viscous flow in boundary layers. One course. *Shaughnessy*

227. Advanced Fluid Mechanics. Flow of a uniform incompressible viscous fluid. Exact solutions to the Navier-Stokes equation. Similarity methods. Irrotational flow theory and its applications. Elements of boundary layer theory. Prerequisite: Mechanical Engineering 226 or consent of instructor. One course. *Shaughnessy*

230. Modern Control and Dynamic Systems. Dynamic modeling of complex linear and nonlinear physical systems involving the storage and transfer of matter and energy. Unified treatment of active and passive mechanical, electrical, and fluid systems. State-space formulation of physical systems. Time and frequency-domain representation. Controllability and observability concepts. System response using analytical and computational techniques. Lyapunov method for system stability. Modification of system characteristics using feedback control and compensation. Emphasis on application of techniques to physical systems. C-L: Electrical Engineering 242. One course. *Garg or Wright*

235. Advanced Mechanical Vibrations. Analytical and experimental procedures applied to design of machines and systems for adequate vibration control. Determination of eigenvalues and eigenvectors by iteration and computer techniques, transfer matrices applied to lumped and distributed systems, analytical and numerical methods of obtaining the pulse response of plane and three-dimensional multimass systems, convolution and data processing, introduction to random vibration. One course. *Hight*

236. Engineering Acoustics and Noise Control. Specification of the physical properties of noise, noise measurement, and absorption, transmission, and propagation of sound. Effects of noise on people, noise exposure, and damage risk criteria. Legal aspects of noise control, source modification, enclosures, barriers, and personnel protectors. Prerequisites: Engineering 123 and Mathematics 111. One course. *Wright*

240. Patent Technology and Law for Engineers. The use of patents as a technological data base is emphasized including information retrieval in selected engineering disciplines. Fundamentals of patent law and patent office procedures. One course. *Cocks*

241. Advanced Mechanical Design. A study of those processes in mechanical design which occur after a prototype has been developed. Areas of study may include prototype testing and evaluation, computer analysis, marketing, CAD, redesign, detail drafting, manufacturing processes for mass production, economic analysis, patents, and entrepreneurial activities. Semester projects using design teams will be used to study these areas. Prerequisite: Mechanical Engineering 141. One course. *Hight*

254. Solar Energy Thermal Processes. Solar radiation instrumentation, measurements, data, and estimation. Radiation heat transfer characteristics of opaque materials and partially transparent media. Performance and design calculations for flat-plate and focusing collectors. Thermal energy storage. Solar water heating and heating and cooling of buildings. Economics and life-cycle costing studies for solar installations. Survey of research, development, and demonstration projects on solar thermal processes. One course. *Chaddock*

265. Advanced Topics in Mechanical Engineering. Opportunity for study of advanced subjects related to programs within mechanical engineering tailored to

fit the requirements of a small group. Prerequisites: approval of Director of Undergraduate or Graduate Studies. One course. *Staff*

277. Optimization Methods for Mechanical Design. Definition of optimal design. Methodology of constructing quantitative mathematical models. Nonlinear programming methods for finding "best" combination of design variables: minimizing steps, gradient methods, flexible tolerance techniques for unconstrained and constrained problems. Emphasis on computer applications and term projects. Prerequisite: consent of instructor. One course. *Wright*

COURSES CURRENTLY UNSCHEDULED

65. Introduction to Energy Technology

156. Combustion Engines

210. Intermediate Dynamics

224. An Introduction to Turbulence

231. Systems Response and Control

232. Nonlinear Analysis

THE MAJOR

The major requirements are included in the minimum total of thirty-two courses listed under the general requirements and departmental requirements. Specific courses which must be included are Engineering 75, 83, 101, 123, and 130; Mechanical Engineering 115, 126, 140, 141, and 150.

School of Nursing (NUR)*

Professor Wilson, *Dean*; Associate Professor Brundage, *Associate Dean*; Professors Gratz and Minniear; Associate Professors Bartol, Chase, Cotanch, Hogue, Horton, Long, McIntire, and Most; Assistant Professors Alexander, Askins, Bullock, Davenport, Dery, Gutmann, Humphrey, McNaull, Roberts, Scallion, Verwoerd, and Wallsten; Emeritus Professors Fortune, Reed, and Stone; Emeritus Associate Professor Schenk; Instructors Calhoon, Hotter, Oehler, and Ward; Lecturers Crill, Davis, and Stamer; Clinical Faculty Barton, Bowers, Bridgman, Bryce, Burkett, Bye, Cherpak, Cole-Wilson, Coyle, Dugan, Fowler, Goolsby, Hewitt, Kennedy, Kinert, Lynds, Miller, McGrath, Modigh, Morgan, Mosher, Painter, Seyler, Sherman, Tenney, Todd, Venegoni, and White

96. Introduction to the Profession of Nursing. An introductory course for sophomore students majoring in nursing, incorporating selected concepts basic to the profession and practice of nursing presented through class presentations, selected readings, and laboratory sessions. Spring; second summer session for transfer students. One course. *Staff*

97, 98. Human Ecology I and II. An interdisciplinary course in the natural sciences covering the impact of a changing physical and biological environment upon human structure and function. Two courses. *Gratz*

101-102. Theoretic and Scientific Bases of Nursing Practice I. Builds upon Nursing 96, 97, and 98 to explore major theories basic to nursing. Concepts relating to the nurse-patient relationship, the self-system, adaptive responses of individuals throughout the life cycle, and the individuals in the context of their subsystems

*At the time of printing, the programs, courses, and credits of the School of Nursing are undergoing significant change. In 1983-84 and thereafter, they will either not be available or not available exactly as described in this bulletin. For information, inquire at the Office of the Registrar.

and the suprasystems of family, community, and society are explored. A systems theory framework is used to consider normal adaptation of the individual as well as major stressors which pose threats to health and human integrity. A systems perspective is also used to assess the individual's coping resources and responses to stressors. Prerequisites: Nursing 96, 97, and 98 or equivalents. Two courses.

103-104. Development of Nursing Skills and Attitudes I. Correlated with Nursing 101-102 by selection of clients of a variety of ages in a variety of settings as exemplars of the individual's normal adaptation and response to stressors. Conferences and seminars enable students to share different experiences and learn how theory and concepts are applicable in different settings and with individuals of varying ages. Nursing practice encompasses the development of psychomotor skills, cognitive skills, and attitudes essential to the process of nursing. Prerequisites: Nursing 96, 97, and 98 or equivalents. Four courses. *Long and staff*

105. Human Genetics and Societal Problems. A course in the current state of research on birth defects, biochemical disorders, the human chromosome complement, and malformations resulting from mishaps in the chromosomes. Open to nonnursing majors. Pass/fail option. Spring only. One course. *Gratz*

121S. Parenthood. An investigation of parenting behavior with a focus on the meaning of experiences to the mother and father and the means by which individuals can maximize the positive potential of these experiences. Open to sophomores or above and nonnursing majors. Pass/fail option. One course. *Staff*

144S. An Introduction to Gerontology. A study of the process of aging as it relates to the elderly with focus on physiological, sociopsychological changes, and economic status. Emphasis will be on selected areas such as theories of aging, demographic changes, and social policy. Open to sophomores, juniors, and seniors, including nonnursing majors. Pass/fail option. One course. *Staff*

155-156. Theoretic and Scientific Bases for Nursing Practice II. These courses use a systems perspective to build on Nursing 101-102 theories, processes, and concepts relevant to nursing practice with families, groups, organizations, communities, as well as with individuals with complex health problems. Factors which influence the health status of populations and shape professional nursing and health care delivery are discussed. Prerequisites: Nursing 102 and 104. Two courses. *Horton and staff*

157-158. Development of Nursing Skills and Attitudes II. These clinical courses, taken concurrently with Nursing 155-156, focus on the application of theories, processes, and concepts relevant to the nursing of individuals with complex health care problems and of families with preventive, supportive, and therapeutic nursing needs through use of the nursing process. Inpatient and outpatient clinical experiences provide opportunities for students to intervene with individuals, families, and groups within the context of organizations and communities. Organization and community theories, concepts, and processes will be applied when assessing the structure and function of a health care group in which they are participating. Prerequisites: Nursing 102 and 104. Four courses. *Horton and staff*

161. Applied Human Physiology. An in-depth study of selected physiological processes significant to health needs. Emphasis is upon those aspects of physiology that are reflected in patient care problems requiring effective nursing intervention. Prerequisite: Nursing 98 or equivalent. Pass/fail option. One course. *Gratz*

169S. Human Sexuality. An exploration of the intrapersonal, interpersonal, and sexual aspects of an individual's existence and the forces shaping prevailing

and future sexual expressions and human sexuality. Open to nonnursing majors. Pass/fail option. One course. *Staff*

175. Loss and Loneliness. Intervention with persons experiencing loneliness as a response to loss of specific relational provisions. Emphasis on deficit and creative responses to loss and mobilization of support systems to help individuals cope with loneliness. Pass/fail option. One course. *Staff*

177. Pediatric Hematology and Oncology Nursing. A detailed examination of basic principles of nursing care of the child with hematologic and oncologic disorders. Emphasis will be placed on pathophysiology, diagnosis, treatment, and nursing care of the child and family. Open to second semester level juniors and seniors. One course. *Humphrey*

178S. Advanced Concepts of Nursing for Patients with Cardiovascular Disease. Examination and clinical exploration of the role of the nurse in providing health care to individuals with cardiovascular disease. Open to senior nursing students and others with special permission. One course. *Staff*

185. Basic Management for Nurses. An introduction to management theory and practice. Using the organizational framework of nursing service the course content will provide a knowledge base from which students will conceptualize, analyze, apply, and value the management process as essential to the delivery of quality nursing care. Open to seniors and RNs. One course. *Chase*

188. Introduction to Nursing Research. Provides the opportunity for students to develop appreciation for nursing research and to study the research process. With guidance students will carry out, individually or in groups, selected research activities related to nursing. One course. *Most*

189. Parental-Perinatal Nursing. Emphasis is placed on theories, concepts, and trends as they relate to individuals and families who experience stress during the childbearing process. Biopsychosocial aspects of problems which occur during the antepartal, intrapartal, postpartal, or neonatal period(s) will be explored with a focus on nursing care management for prevention of complications or restoration to optimal level health. One course. *Staff*

191, 192, 193, or 194. Independent Study. Demonstration of self-direction in planning, implementing, evaluating, and reporting an independent learning experience. The required study for nursing majors must focus on nursing. Pass/fail option. Minimum of one course. *Staff*

197, 198. Undergraduate Thesis. Systematic study of a nursing problem. The study culminates in a written thesis. The method of study may involve research or may be limited to the student's critical review of others' work which bears upon the problem selected for study. Prerequisites: completion of the junior year with at least a *B* average in all nursing courses, including electives in nursing, and consent of course coordinator. Two courses. *Hogue*

199. Selected Topics. Consent of the faculty member required. In selected instances the Office of the Associate Dean will need to be consulted for administrative details. One course. *Staff*

205. Patient Assessment. An introduction to the methods and techniques of eliciting and recording a health history and performing and recording a complete physical examination. Emphasis on the application of those skills to nursing practice. Open to senior and graduate nursing students. One course. *Staff*

222. Issues in Women's Health Care. Critical examination of issues in women's health care including topics related to women as health providers as well as clients. Open to nonnursing majors. One course. *Dery*

225. Work and Health. Relationships between work and health are explored within a systems framework in which work in its organized form is viewed as stressful yet as a significant offering of modern society for preventing even greater stress. Constraints and opportunities in work are considered through exploration of career, task, and organization stresses. Individual, family, and organizational strategies and tactics for dealing with the complex network of factors associated with work are presented. Open to senior and graduate students. One course. *Hogue*

263. Crisis Intervention. Exploration of crisis theories with methods of intervention in assisting individuals and families before, during, and following the crisis. Discussions of specific human and environmental crises with emphasis on suicidal behavior. Application of theories and techniques through clinical practice. One course. *Hewitt*

288. Oncological Nursing. An in-depth study of nursing the patient/client with cancer, focusing on prevention, detection, diagnosis, treatment, and rehabilitation. Open to seniors and graduate nursing students. One course. *McIntire or McNaul*

COURSES CURRENTLY UNSCHEDULED

99. Introduction to Statistics in the Health Field

176S. Nonpharmacological Management of Pain and Stress

179. Nursing in Nephrology

184. Family Health Care in a Pluralistic Society

186. Introduction to Gerontological Nursing

187. Neonatal Nursing Care

242. Gerontological Nursing

246. Nutrition in the Community Context

248. Health and the Family in the United States

269. Clinical Aspects of Human Sexuality

286. Thanatology

THE MAJOR

The major requirements are included in the minimum total of thirty-two courses listed under lower and upper division requirements. See the section on the School of Nursing in the chapter "Degree Programs." The specific courses in the upper division that must be included are Nursing 101, 102, 103, 104, 155, 156, 157, 158, and 191, 192, 193, or 194.

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EDITOR
Judy A. Beck
SENIOR EDITORIAL ASSISTANT
Elizabeth Matheson
Office of University Publications

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Duke University does not discriminate on the basis of race, color, national and ethnic origin, sex, handicap, or age in the administration of educational policies, admission policies, financial aid, employment, or any other University program or activity. It admits qualified students to all the rights, privileges, programs, and activities generally accorded or made available to students. For further information, call Dolores L. Burke, Equal Opportunity Officer, telephone 919-684-8111.

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University Administration

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General Information



History

In 1924, James Buchanan Duke established the Duke Endowment, and thus made possible the creation of Duke University.

I have selected Duke University as one of the principal objects of this trust because I recognize that education, when conducted along sane and practical, as opposed to dogmatic and theoretical, lines is, next to religion, the greatest civilizing influence. I have selected hospitals as another of the principal objects of this trust because I recognize that they have become indispensable institutions, not only by way of ministering to the comfort of the sick, but in increasing the efficiency of mankind and prolonging human life . . . I very much hope that the people will see to it that adequate and convenient hospitals are assured in their respective communities . . . It is to these rural districts that we are to look in large measure for the bone and sinew of our country.

The School of Medicine and Duke Hospital, then a 400-bed facility, were opened in 1930 under the leadership of the first Dean, Dr. Wilburt C. Davison. Today the hospital, with over 1,000 beds, is one of the largest private hospitals in the South. Duke University Medical Center has become a leader in contemporary medicine; by its continued dedication to educational programs, it has been closely involved in the development of the allied health field.

Programs in hospital administration and dietetics were initiated at the Medical Center in 1930. Programs in several disciplines dealing primarily with the laboratory aspects of clinical medicine began soon afterward. Due to marked advances in the field of medicine, new allied health programs were developed in the early 1960s to assist in the many medical specialties. Today there are over 400 students enrolled in Duke University allied health programs.

The Division of Allied Health Education of the School of Medicine officially represents the interests of these health-related educational programs by being the liaison with the entire medical complex. It coordinates all student and faculty activities and provides for such varied educational services as the planning and evaluation of courses and circulation of instructional materials.

Resources for Study

Libraries. The Perkins Library, among the finest university libraries in the country, contains over 3,000,000 volumes and over 5,000,000 manuscripts. Over 50,000 volumes are added annually. Separate departmental and professional school libraries provide notable collections in several disciplines.

The Medical Center Library/Communications Center is located in the Seeley G. Mudd Building, midway between the north and south Medical Center campuses. The

Seeley G. Mudd Building also contains the Medical Center Bookstore and the Searle Center for Continuing Education.

The Medical Center Library attempts to provide all informational services and collections necessary to further educational, research, and clinical activities in the medical field. The collection of approximately 183,000 volumes and 2,458 current journal subscriptions is freely available for use by Medical Center students and personnel; study accommodations for 500 readers include extensive provisions for audiovisual learning. The library also includes the Trent Collection which is unsurpassed in the Southeast as a resource for study of the history of medicine. A branch collection of books and journals is maintained in the Nanaline B. Duke Medical Sciences Building.

The Medical Center Library is open: Monday through Friday, 8:30 A.M. to midnight; Saturday, 8:30 A.M. to 6:00 P.M.; Sunday, 12:00 noon to midnight. Summer and holiday hours are as announced.

Director: Warren P. Bird, M.S. (Columbia, 1964), *Associate Professor of Medical Literature*; Curator of the Trent Collection: G.S.T. Cavanagh, B.S., B.L.S. (McGill, 1951), *Professor of Medical Literature*.

The library in the Durham Veterans Administration Medical Center contains over 3,000 books and receives 255 journals. It also supplies a reference and bibliographic service to both staff and residents. In addition, literature searches are made upon request.

The Medical Center Bookstore. This bookstore offers a wide selection of biomedical textbooks and reference books, as well as an assortment of laboratory and clinical instruments, lab coats, scrub dresses, and office supplies. Facilities for browsing in a pleasant atmosphere are available, as are special individualized services, such as bookbinding. The bookstore is open: 8:30 A.M. to 5:00 P.M., Monday through Friday. Manager: Kenneth Baxley

The Searle Center for Continuing Education in the Health Sciences. This center provides accommodations for conferences, symposia, lectures, and meetings to support the continuing education activities of the Medical Center. Provisions have been made for banquet and food service arrangements to complement the meeting facilities.

Audiovisual Educational Facilities. Duke University Medical Center Division of Audiovisual Education and the Veterans Administration Medical Center Medical Media Production Service have production facilities in medical art, photography, and television. These serve the allied health programs by providing all types of audiovisual materials for teaching, research, and patient care. Instruction in the production and use of audiovisual materials is a part of the course of instruction in several allied health programs.

Computing Facilities. The Duke University Computation Center provides faculty and students with a facility for research and instruction in computing. It is presently equipped with an IBM 370 Model 158 which is connected by microwave to an IBM 3081 located at the Triangle Universities Computation Center (TUCC) in the Research Triangle Park. In addition to the University computation center there are four medium-speed terminals, several low-speed keyboard terminals, and forty-two IBM 5100 stand alone mini-computers available on the campus. The mini-computers are in clusters of seven and are in six locations on the campus.

Hospitals. Duke University Hospital, a 1,008-bed facility, has a dual purpose of providing both patient care and professional education. Comprehensive diagnostic and treatment facilities are provided at various levels of patient care ranging from intensive to minimal care units. Private, semiprivate, and ward accommodations are utilized by the more than 30,000 patients admitted each year. Special diagnostic and

treatment units such as the cardiac catheterization laboratory, hemodialysis laboratory, and the hyperbaric oxygenation chamber are also housed in the hospital. Out-patient services include the public clinics, private clinics, and the emergency service. Duke Hospital is fully accredited by the Joint Committee on Accreditation of Hospitals and is approved for internship and residency training by the Council on Medical Education of the American Medical Association.

The Durham Veterans Administration Medical Center is located within walking distance of the Duke University Medical Center. All full-time professional staff members of the hospital are also members of the faculty of the Duke University School of Medicine. The Veterans Administration Medical Center, a 475-bed facility, provides the Duke University Medical Center with an excellent opportunity for closely integrated student teaching and house staff training.

Other patient care facilities directly affiliated with the Medical Center include the Lenox Baker Children's Hospital of North Carolina, a 40-bed residential rehabilitation center for children; and Sea Level Hospital, a 72-bed general hospital.

Several of the allied health programs have affiliations with other hospitals and medical institutions for clinical instruction.

Student Life

Living Accommodations. Because of the shortage of residential space, students enrolled in allied health certificate programs are not eligible for student housing. Student housing includes dormitories and apartments. To full-time students in degree (not certificate) programs, a limited number of apartments are available in the Central Campus apartment complex. No dormitory housing is available to any allied health students. Suitable living arrangements are extremely limited in nearby areas. Students planning to live off campus should make arrangements in advance of matriculation date in order to be assured accommodations. Information concerning housing is provided on request by the Central Campus Office, Department of Housing Management, 217 Anderson Street, Durham, North Carolina 27705.

Dining Facilities. Several dining facilities located in and near the Medical Center are available to students. In the Duke University Union Building, there are two cafeterias and a dining room. There are also cafeterias in the Trent Drive Hall and the Veterans Administration and Duke hospitals.

Student Financial Aid. Duke University recognizes the responsibility of students and their families to provide funds according to their ability to achieve the educational objective. Students are encouraged to pursue every available source of support through their local and state student assistance programs.

All programs are approved for veterans education benefits (G.I. bill) for those who are eligible. Some of the programs have limited student support available through stipends or special scholarships.

Financial aid is available through Duke in limited amounts in the form of loans. When all institutional funds are pooled, the amount available to a totally needy student is inadequate to meet the school's recognized costs. Duke University is a lender under the Federally Insured Guaranteed Student Loan Program. A Graduate and Professional Schools Financial Aid Service (GAPSFAS) form from applicants and their parents (and spouse, if applicable) is required in addition to the Duke University Financial Aid Application. A copy of the student's (and spouse's, if applicable) federal income tax return for the previous taxable year is required. In the case of the dependent student, a copy of the parent's federal income tax return for the last taxable year is also required. Duke University reserves the right to decline to approve loan applications for those applicants who do not have a satisfactory credit history. U.S. citizen-

ship or permanent residence visa is required of all students receiving loans through the school.

It is the responsibility of recipients of financial aid to keep the Medical Center Office of Financial Aid informed of any outside financial assistance they may receive. It must be understood that Duke reserves the right to reconsider its offer of financial assistance in the event of a major outside award to a recipient. No financial aid funds may be used during a period when the recipient is not involved with work toward the degree or certificate. Part-time or special students are not eligible for financial aid.

Students who have been accepted for matriculation routinely receive financial aid applications. Annual reapplication is required of all financial aid recipients.

Pell Grant (formerly BEOG) is a federally funded grant for students with financial need who have not earned a baccalaureate degree and are enrolled in any postsecondary educational program. To apply the applicant completes a Financial Aid Form (FAF) which may be obtained from a high school guidance counselor or any financial aid office.

North Carolina Student Incentive Grant (NCSIG) is available to residents of North Carolina who are enrolled in any postsecondary educational program in North Carolina. The applicant must demonstrate substantial financial need and must not have earned a baccalaureate degree. Application deadline is 15 March for the following academic year. To apply the applicant completes a Financial Aid Form (FAF) which may be obtained from College Foundation, Inc., 1307 Glenwood Avenue, Raleigh, North Carolina 27605; a high school guidance counselor, or financial aid office.

North Carolina Legislative Tuition Grant is a direct grant of \$650 from the state to each North Carolinian enrolled in a private educational institution in North Carolina who is studying toward the first baccalaureate degree. No application is required.

North Carolina Educational Loan Program. The North Carolina Department of Human Resources administers the Educational Loan Program for domiciliaries of North Carolina pursuing training in certain health professions who agree to practice their specialties as qualified professionals in underserved areas or programs of the state. Some of the fields of study supported are anesthesia, medical technology, physical therapy, and physician assistant. Factors considered in awarding loans: ability to complete a training program; motivation to fulfill program goals; financial resources available to the applicant from other sources; and ability to meet domiciliary requirements. Loan amounts vary depending on the program of enrollment; they are renewable depending on length of curriculum; and recipients agree to cancel their obligations by practice in shortage areas or programs of North Carolina. For further information, contact the Educational Loan Program, P.O. Box 12200, Raleigh, North Carolina 27605.

Every effort will be made to assist the student with tuition and living expenses within the framework of school policies which may be in effect at the time. However, as funds are limited, prior indebtedness will not be given favorable consideration as part of the student's budget. A financial aid brochure and student budget for each allied health program are available, upon request, in the spring of each year. Any applicant having further questions may write to the Coordinator, Financial Aid, 126 Davison Building, Box 3005, Duke University Medical Center, Durham, North Carolina 27710.

Student Health Service. The facilities of the Student Health Service Clinic located in the Pickens Building are available year-round to all allied health students. The clinic provides outpatient treatment, routine laboratory and x-ray examinations necessary for the diagnosis of acute medical and surgical problems, and many other services. A separate fee for this service is assessed for each student. Participation is mandatory for all Duke students unless a waiver is granted by the appropriate Dean. The coverage described above does not extend to spouses and children. However, dependents are eligible to use the facilities of the Duke University Medical Center, as are all members

of the community, but they are responsible for health costs incurred. The Student Health Service Clinic is open from 8:00 A.M. to 7:00 P.M., Monday through Friday; 9:00 A.M. to 2:00 P.M., Saturday; 2 P.M. to 5 P.M. on Sundays. The Sunday clinic is designed for the evaluation of illnesses or injuries which cannot wait until regular weekday Student Health Service hours. This clinic is open only during the spring and fall semesters of the regular academic year. It is closed during summer sessions. The facilities of the University Infirmary on East Campus are available to allied health students from the opening of the University in fall until graduation day in spring.

Student Health Insurance. In order to provide twenty-four-hour protection to students for accidents and sicknesses not covered by the Student Health Services, the Student Accident and Sickness Insurance policy is available. Benefits include payment of hospitalization and surgical and medical fees. Persons are covered on and off campus, at home, while traveling between home and school, and during interim vacation periods. The premiums for a student (and spouse or family) for the year 1983-84 will be more fully described in the insurance brochure sent from the Bursar's office. If at the time of matriculation, students do not have a sickness and accident policy, it is mandatory that they purchase this insurance.

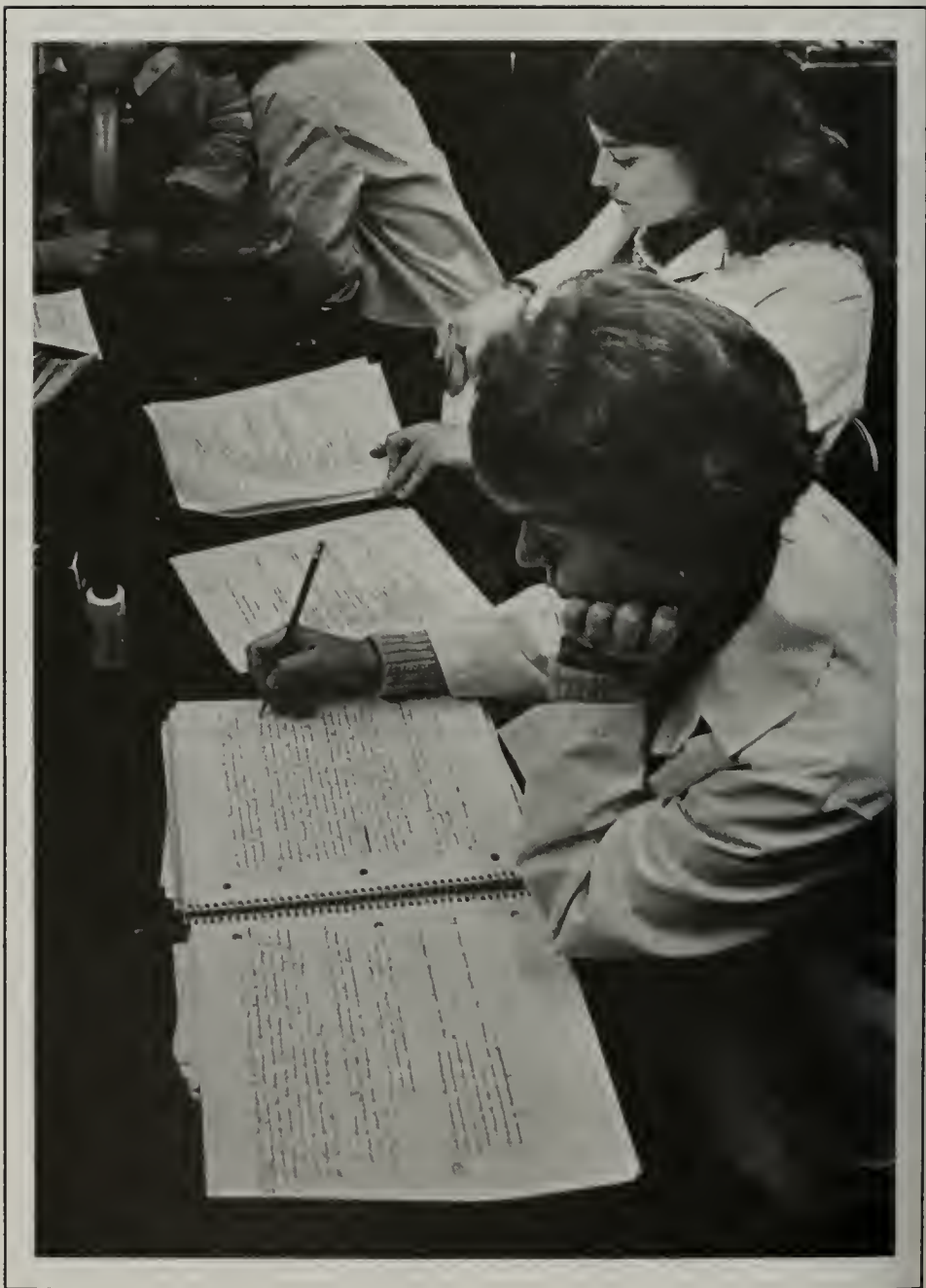
Counseling and Psychological Services. CAPS provides a comprehensive range of counseling and psychological services to assist and promote the personal growth and development of Duke students. The professional staff is composed of clinical social workers, psychologists, and psychiatrists. A number of short-term seminars or groups focusing on skills development and special interests such as coping with stress and tension, fostering assertiveness, enriching couples communication, and dealing with separation and divorce are also offered. A policy of strict confidentiality is maintained. Individual evaluation and brief counseling/therapy as well as career and skills development seminars are covered by student health fees. Appointments may be made by calling 684-5100 or visiting CAPS, 214 Old Chemistry Building.

Athletic Events. All students paying the full Duke University undergraduate tuition are issued Duke University identification cards and may attend all home intercollegiate athletic contests on a first-come, first-served basis. Graduate students and those enrolled in the certificate program may purchase a book of tickets for regular season home football and basketball games. All tickets are sold on a first-come, first-served basis. The ticket office is located in Cameron Indoor Stadium.

Judicial System and Regulations. Duke University expects and requires of all its students full cooperation in developing and maintaining high standards of scholarship and conduct. Each student is subject to the rules and regulations of the University which are currently in effect or which are, from time to time, put into effect by the appropriate authorities of the University. At the same time, the individual is responsible for decisions and choices within the framework of the regulations of the community as Duke does not assume in loco parentis relationships.

Any student, in accepting admission, indicates a willingness to subscribe to and be governed by these rules and regulations and acknowledges the right of the University to take such disciplinary action, including suspension or expulsion, for failure to abide by these regulations or for other conduct adjudged unsatisfactory or detrimental to the University. A copy of the Allied Health Judicial System including a code of ethics, rules of conduct, and judicial procedures will be provided each student.

Academic Procedures and Information



Admissions

Admissions to all Duke University educational programs are reviewed by an appropriate admissions committee. Students matriculating in the various allied health programs must meet the admission standards of that program.

Grading and Grade Requirements

Final grades on performance in academic work are sent to students after the examinations at the end of the fall and spring semesters.

Passing Grades. Passing grades are *A*, exceptional; *B*, superior; *C*, satisfactory; and *D*, low pass. A passing grade may be modified by a plus or minus. A *Z* may be assigned for the satisfactory completion of the first semester of a two-course sequence. This permits an instructor to assign an earned grade for the entire year during the grading period for the second course of the sequence.

The D Grade. Although the *D* grade represents low pass, no more than two courses passed with *D* grades may be counted among the thirty-two courses required for graduation.

Failing Grades. A grade of *F* or *U* (see pass/fail option below) indicates that the student has failed the course, which is recorded on the student's record. If the course is taken again, a second entry of the course and the new grade earned is made on the record, but the first entry is not removed.

Pass/Fail Grading Option. With the consent of the instructor and program director, a student may choose to be graded on a pass/fail basis in one elective course each semester or summer session.

A student enrolling in a course on a pass/fail basis completes all the work of the course but receives either a pass, (*P*), or fail, (*U*), in lieu of a standard grade. After the first two weeks of classes in any semester, no student may change to or from a pass/fail basis. A pass grade may not subsequently be converted to a regular letter grade nor may the course be retaken on a regular credit basis.

Grades When Absent from Final Examination. In all cases in which a student is absent from a final examination, an *X* is received instead of a final grade. If the student does not present an acceptable explanation for the absence to the Office of the Dean for Allied Health Education within forty-eight hours after the scheduled time of the examination, the *X* is converted to an *F*. If the absence is excused by the Dean the student arranges with the instructor for a makeup examination. An *X*, not cleared by

the end of the semester following the examination missed, is converted to an *F*. See the section on Final Examinations and Excused Absences.

Grades for Incomplete Work. If because of illness or other emergency a student's work in a course is incomplete, an *I* may be received for the course instead of a final grade. Incomplete courses must be completed before the close of the succeeding semester; otherwise, the *I* is converted to an *F*. Seniors must complete all courses before graduation. A student whose work is incomplete and who is also absent from the final examination receives an *X* for the course.

For the purpose of determining if a student satisfies continuation requirements, an *I* is counted as failing to achieve satisfactory performance in that course.

Graduation and Continuation Requirements

Continuation Requirements. A student must achieve a satisfactory record of academic performance and make satisfactory progress toward graduation each semester. To remain in the University a student must not fail two or more courses in any semester. A student who, for any special reason, has been permitted to enroll for three or fewer courses must pass all courses.

Students are reminded that in cases where continuation is in question, incomplete work in any course is counted as a failure to achieve satisfactory performance in that course. Such courses must be completed in time for final grades to be submitted to the Registrar no later than the day preceding the opening of the spring semester or 15 June in the summer.

Any student excluded under the provisions of this regulation may request to have the case reviewed by the Dean, Allied Health Education.

Requirements for Degree. To be graduated a student must pass a minimum of thirty-two courses (including the sixteen courses required for admission) and all courses prescribed in the program of study. Of the courses required for graduation, no more than two courses with *D* grades will be accepted.

Residence Requirements. At least sixteen semester-courses must be completed satisfactorily at Duke. This must include the final four semesters.

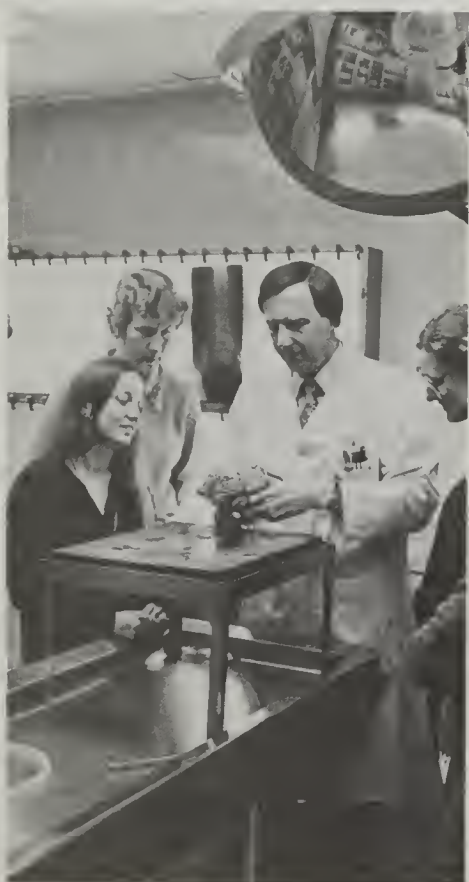
Commencement

Graduation exercises are held once a year in May, when degrees are conferred on, and diplomas issued to those who have completed requirements by the end of the spring semester. Those who complete degree requirements by the end of a summer term or the end of a fall semester become eligible to receive diplomas dated 1 September or 30 December, respectively. There is a delay of about one month in the mailing of September and December diplomas because the diplomas are mailed after final approval by the Academic Council and the Board of Trustees. Any persons who receive diplomas dated 1 September or 30 December may return for the commencement weekend and participate in the graduation exercises in May following the date of the diploma.

Eligibility for Academic Honors

To determine eligibility for academic honors, only letter grades earned at Duke, with the exception of the *P* (pass) grade, enter into the calculation of the average.

Graduation Honors. Full-time or part-time students who earn the following averages for all work taken at Duke are graduated with honors: a *B* average earns a degree *cum laude*; a *B+* average earns a degree *magna cum laude*, and an average of *A* or above earns a degree *summa cum laude*.



Course Information

The unit of credit for academic work is the semester-course. Double-courses and half-courses are recognized.

Transfer Credit. Duke credit may be granted for course work satisfactorily completed at other regionally accredited, degree-granting institutions. Courses in which grades of less than C have been earned are not accepted for transfer credit. Semester-course credit awarded at Duke for satisfactorily completed courses cannot, of course, be directly equated with semester-hour or quarter-hour credits. A semester's work accepted as a normal course load by the other institution transfers as a block of four course units at Duke, provided the courses taken at the other institution are acceptable by Duke as Duke course equivalents or electives. Ordinarily, transfer students will not be awarded more than four course units for one semester's work unless they have satisfactorily completed more than the normal course load at the institution from which they transferred. All courses approved for transfer credit are listed on the student's permanent record at Duke (unless the student has received a degree) but grades earned in such courses are not recorded. Courses taken at other institutions are evaluated by the Medical Center Registrar.

Students who transfer to Duke may receive credit for a maximum of two years of work at other institutions of approved standing. No credit is given for work completed by correspondence, and credit for no more than two semester-courses is allowed for extension courses.

Course Load and Eligibility for Courses. The normal and expected course load each semester is four to five semester-courses. To take fewer than four or more than five semester-courses in any semester, a student must have the approval of the program director and the Dean for Allied Health Education. No student, however, may take more than six courses in any semester.

Course Audit. With the written consent of the instructor and the program director, a full-time degree student is allowed to audit one or more courses in addition to the normal program. After the first two weeks of classes in any semester, no student classified as an auditor in a particular course may take the course for credit, and no student taking a course for credit may change classification to an auditor. A student may not repeat for credit any course previously audited. Auditors submit no daily work, take no examinations, and receive no credit for courses.

Course Changes after Classes Begin. Students, with the approval of the program director, may drop and add courses during the first two weeks of classes. Courses added during the second week of classes require the approval of the appropriate instructor in addition to that of the program director.

Students may drop a course without penalty until the time midsemester grades are assigned if they are clearly carrying a course overload. Factors such as poor health or necessary outside work are also considered in permitting withdrawal from courses without penalty. A W is entered on the permanent record in lieu of a grade in all cases where withdrawal without penalty is approved. After the time limit has expired, withdrawal from any course will ordinarily result in a grade of F. Courses discontinued prior to midsemester without approval will also be assigned an F.

Class Attendance and Excused Absences

Responsibility for class attendance rests with the individual student. Students are expected to attend classes regularly and punctually and must accept the consequences of failure to attend. An instructor is privileged to refer students to the Dean for Allied Health Education for suitable action if, in the opinion of the instructor, their



work or that of the class suffers because of absences. When excessive absences result in a student's failure to carry a normal course load, the Dean for Allied Health Education, after a conference with the student, will determine whether the student may continue enrollment in the college.

Absences from required classes and tests ordinarily are excused only for illnesses certified by a proper medical official of the University, and for authorized representation of the University in out-of-town events. Officials in charge of groups representing the University in such events are required to submit names of students to be excused to the Office of the Dean for Allied Health Education forty-eight hours before absences are to begin.

Final Examinations and Excused Absences

Customarily, an examination is the final exercise in an undergraduate course, but it is understood that not all courses profit from this process. Therefore, unless departmental policy stipulates otherwise, the conduct of the final exercise is determined by the instructor, except that a final written examination may not exceed three hours in length and a final take-home examination may not require more than three hours in the actual writing.

Absences from final examinations are excused by the Dean for Allied Health Education only in exceptional circumstances, such as illness certified by a medical official of the University or other conditions beyond the control of the student. A student who misses a final examination must notify the Office of the Dean for Allied Health Education within forty-eight hours after the scheduled time of the examination. Failure to so notify and to present an acceptable reason for absence from the examination will result in the student's receiving an *F* in the course.

Changes in Status

Withdrawal and Readmission. A student who wishes to withdraw from the University must give official notification to the Dean for Allied Health Education. Withdrawals at student initiative prior to the Thanksgiving recess in the fall semester or prior to 15 April in the spring semester are coded as voluntary, and a *W* is entered in lieu of a grade for each course. Voluntary withdrawals after these dates are permitted only in the event of emergencies beyond the control of the student.

Applications for readmission are made to the Medical Center Registrar. Each application is reviewed by the admissions committee of the program to which the student applies. A decision is made on the basis of several criteria including the applicant's academic record at Duke, the prospects of completing requirements for graduation, the student's citizenship record at Duke, evidence of increasing maturity and discipline, the degree of success attendant upon activities during the time away from Duke, and finally the applicant's relative standing among the group of students applying for readmission.

Leave of Absence. A student in good standing may apply in writing to the Dean for Allied Health Education to take a leave of absence for one or two semesters. The application must come before the end of the fall semester for a leave of absence during the spring semester, and before 15 July for a leave of absence during the fall semester. If the leave is approved, the student must keep the Dean informed of any change of address.

Full-Time and Part-Time Degree Status. Normally, undergraduate students who are candidates for degrees are expected to enroll for a normal course load each semester. A student who needs to change from full-time status, or from part-time to full-time status, must have the approval of the program director and the Dean for

Allied Health Education. For special reasons approved by the program director and the Dean, a full-time degree student who is qualified to continue may register in a part-time degree status for no more than two courses.

Admission

Students seeking admission to the Bachelor of Health Science degree programs must have completed two years of study at an accredited institution. In addition, they must have a minimum of sixteen course equivalents (sixty semester-hours/ninety quarter-hours) of transferable credit including at least one course in semester-hours) of transferable credit including at least one course in English, three in natural science, three in social sciences or history, and one in humanities. Additional requirements are listed in the description of the program.

Other Information

Release of Student Records. No confidential information contained in student records (academic or otherwise) is released to non-University persons or to unauthorized persons on the campus without the consent of the student. Consent is evidenced by each student's signing a form which authorizes the release of personal data. The form may provide for the release of information to one or more persons or agencies only, or it may be a blanket release. Blank forms to authorize or revise the permission are available in the office of the program directors.

Identification Cards. Undergraduate students are issued two-part identification cards which they should carry at all times. The cards are the means of identification for library privileges, University health services, athletic events, and other University functions or services open to them as University students. Students will be expected to present their cards on request to any University official or employee.

The cards are not transferable, and fraudulent use may result in loss of student privileges or suspension. A student should report the loss of this card immediately to the Registrar's office. The cost of a new identification card is \$5.

Payment of Bursar Accounts for Fall and Spring. Monthly invoices for tuition, fees, and other charges will be sent by the Bursar's office and are payable by the invoice due date; no deferred payment plans are available. As a part of the agreement of admission to Duke University a student is required to pay all invoices as presented. If full payment is not received, a late payment charge as described below will be assessed on the next invoice and also certain restrictions as stated below will be applied.

Late Payment Charge. If payment in the amount of the total amount due on the student invoice is not received by the invoice due date, a penalty charge will be accrued from the billing date of the invoice. The penalty charge will be at a rate of 1½ percent per month (16 percent per annum) applied to the past due balance on the student invoice. The past due balance is defined as the previous balance less any payments and credits, received during the current month and also any student loan memo credits, related to the previous balance, which appear on the invoice.

Restrictions. An individual will be in default of this agreement if the total amount due on the student invoice is not paid in full by the invoice due date. An individual who is in default will not be allowed to register for classes, receive a transcript of academic records, have academic credits certified, be granted a leave of absence, or receive a diploma at graduation. In addition, an individual in default may be subject to withdrawal from school.

Financial Information



Tuition and Fees*

Estimated Expenses for an Academic Year. Certain basic expenditures such as tuition, board, and room are to be considered in preparing a student's budget. Tuition and some fees vary by program. See each program for the appropriate amounts for this. For the Bachelor of Health Science programs the estimated expenses are:

Tuition	\$6,250 per year
Books, uniforms, and supplies	\$500 per year
Food	\$195 per month
Laboratory Fees	See individual course requirements
Lodging	\$220 per month
Student Health Fee	\$85 per semester
Student Accident and Sickness Insurance	\$130 per year (single)
	\$362 per year (married)
Miscellaneous (travel, laundry, clothing, etc.)	\$194 per month

Debts. No records are released and no students are considered by the faculty as candidates for graduation until they have settled with the Bursar for all indebtedness.

Bills may be sent to parents or guardians provided the Bursar has been requested in writing to do so. Failure to pay all University charges on or before the times specified by the University for that semester will bar the student from class attendance until the account is settled in full.

Registration Fees and Deposits. On notification of acceptance, baccalaureate degree students are required to pay a nonrefundable first registration fee of \$25.* Students in the Pathologists' Assistant and Physician Assistant Programs are required to make a deposit of \$75. The deposit will not be refunded to accepted applicants who fail to matriculate. For those who do matriculate, the deposit is applied to the cost of tuition.

Late Registration. Students who register in either semester at a date later than that specified by the University must pay to the Bursar a fee of \$25.

Part-time Students. In the regular academic year, students who register for no more than two courses in a semester are classified as part-time students. Part-time students are charged at the following rates: One course, \$777; half-course, \$388.50; quarter-course, \$194.25; one course plus laboratory or preceptorship, \$1,036. Regis-

*These are estimated figures only. Tuition and fees are subject to change without notice.

tration for more than two courses requires payment of full tuition. Graduate students registered for undergraduate courses will be assessed three units for nonlaboratory courses and four units for laboratory courses. Nondegree men and women beyond usual college age who are on review for admission to degree programs, as designated by the Office of Continuing Education, pay fees by the course whether the course load is one, two, or three courses.

Auditors. Auditing of one or more courses without charge is allowed students paying full fees, provided that the consent of the instructor is obtained. In 1982-83 students who were enrolled for one or two courses could audit other courses by payment of \$78 for each course audited. With the consent of the appropriate instructor and the Registrar, graduates of Duke could audit undergraduate courses for \$78 each course.

Duke Employees. Full-time employees with one or more years of service with the University may request permission to take for credit or audit up to two courses during any one semester. Permission may be granted based on the individual merits and circumstances of each application. Employees receiving permission to take such courses for credit will be charged one-half of the tuition rate for part-time students as shown above. Employees are required to submit a formal application by 1 December or 15 July.

Fees for Transcripts. Requests for transcripts of academic records should be directed to the Office of the Medical Center Registrar. A minimum fee of \$2, payable in advance, is charged for a single copy.

Student Health Fee. All regular full-time undergraduate students (those registered for three courses or more) and all regular full-time graduate and professional school students (those registered for nine units or more and for three units if the preliminary examination has been passed) are required to pay a health fee that is nonrefundable after the first day of classes in the semester. The only exceptions to this requirement are the following reasons: (1) if the student is covered by a spouse's or parents' Duke University employee Blue Cross-Blue Shield insurance or (2) if, as a veteran, the student is eligible for and elects to use the Veterans Administration Medical Center services. A waiver form will be provided and must be completed and returned with the payment of tuition if the student elects to waive the fee for the aforementioned two reasons.

The student health fee entitles the student to outpatient treatment through the Student Health Service or inpatient treatment in the East Campus Infirmary. The health fee is not to be confused with the Duke Student Accident and Sickness Insurance (the premium for this insurance is minimized due to the existence of the Student Health Services) which covers a large number of medical costs above and beyond the treatment available through the Student Health Services. The identification of a separate student health fee in no way changes the policy concerning the Student Accident and Sickness Insurance. A Student Health brochure will be distributed at the time the semester enrollment card is picked up at the beginning of the term.

Student Accident and Sickness Insurance. At time of matriculation, students must provide proof of coverage under an accident and sickness insurance policy or purchase the Duke Student Accident and Sickness Insurance policy. This insurance policy provides protection twenty-four hours per day during the twelve-month term of the policy of each student insured. Students are covered on and off the campus, at home, or while traveling between home and school and during interim vacation periods.

Refunds

If a student withdraws, tuition is refunded according to the following schedule:

<i>Withdrawal from Baccalaureate Programs</i>	<i>Refund</i>
Before classes begin	Full amount
During first or second week	80%
During third to fifth week	60%
During sixth week	20%
After sixth week	None
 <i>Withdrawal from Certificate Programs*</i>	 <i>Refund</i>
Before classes begin	Full amount
During first week	80%
After first week of classes	None

*Course fees for students in certificate programs are payable on a yearly basis.

Bachelor of Health Science Degree Programs



Duke University Medical Center awards a Bachelor of Health Science degree to students who complete either the Pathologists' Assistant or Physician Assistant Program.

Pathologists' Assistant

ADMINISTRATION

Chairman, Department of Pathology: Robert B. Jennings, M.D., *Professor of Pathology*
Director, Pathologists' Assistant Program: Philip C. Pratt, M.D., *Professor of Pathology*
Associate Director, Pathologists' Assistant Program: Kenneth R. Broda, M.A., Ph.D., *Associate in Pathology*
Assistant Associate Director, Pathologists' Assistant Program: Pamela B. Mazzeo, B.S., B.H.S., P.A.

FACULTY ADVISORY BOARD

Professors: Dolph O. Adams, M.D., Ph.D.; Donald B. Hackel, M.D.; Robert B. Jennings, M.D.; William W. Johnston, M.D.; Philip C. Pratt, M.D.; Joachim R. Sommer, M.D.; F. Stephen Vogel, M.D.

FACULTY

Professor: Philip C. Pratt, M.D.
Associate Professors: Frances K. Widmann, M.D.; Peter Zwadyk, Ph.D.
Assistant Professors: Robin Vollmer, M.D.; Jane Gaede, M.D.
Assistant Medical Research Professor: James G. Lewis, Ph.D.
Adjunct Assistant Professor: Philip A. McHale, Ph.D.
Associates: J. Phillip Pickett, H.T.(ASCP); Margaret C. Schmidt, MT(ASCP)SH, M.A.T.; Kenneth R. Broda, Ph.D.
Page Hudson, M.D., *Chief Medical Examiner, State of North Carolina and Professor of Pathology, University of North Carolina Medical Center.*
John Butts, M.D., *Associate Chief Medical Examiner, State of North Carolina*
Robert Thompson, M.D., *Associate Chief Medical Examiner, State of North Carolina*
Instructors: Pamela B. Mazzeo, B.S., B.H.S., P.A.; Ronald L. Mitchell, A.B.A., *Chief Medical Media Production Service, V.A. Medical Center*; James G. Lewis, B.H.S., P.A.; Iris W. Long, M.T. (ASCP), B.S.

The Pathologists' Assistant Program is designed to meet the growing need for trained personnel to assist the anatomic pathologist in the areas of surgical and autopsy pathology including histopathology and medical photography. The Duke Pathologists' Assistant Program was the first program to educate such individuals, and the acceptance of Duke graduates by the medical community has led to the development of similar programs. Upon completion of the program, students will have acquired knowledge and skills which will permit them to fill important roles in academic, forensic, or private pathology environments.

Program of Study. The program is two calendar years in duration and includes four semesters of practical and academic training and two successive three and one-half month summer externships. The externships, consisting of practical training in autopsy pathology, surgical pathology, forensic pathology, and histopathology, are conducted principally within the Department of Pathology, although a limited number of externships are available in affiliated hospitals. Upon successful completion, the Bachelor of Health Science degree and a certificate of achievement are awarded.

Curriculum. Students must complete the following:

Junior Year

<i>Fall semester</i>		<i>Course Weight</i>
ANA 101	Human Anatomy	1
PHS 102	Basic Human Physiology	1
PTH 102	Histologic Technique and Interpretation	1
PTH 164	Clinical Diagnostic Methods	1
PTH 107	Human Pathology	1
<i>Spring semester</i>		<i>Course Weight</i>
PTH 200	Pathology	2
PTH 160	Autopsy Technology	1
PTH 161	Medical Photographic Technology	1

Senior Year

<i>Fall semester</i>		<i>Course Weight</i>
PTH 110	Systemic Pathology	½
PTH 165	Surgical Pathology	1
PTH 167	Autopsy Practicum	1
PTH 183	Special Autopsy Techniques and Procedures	1
<i>Spring semester</i>		<i>Course Weight</i>
PTH 111	Systemic Pathology	½
PTH 162	Laboratory Management and the Computer	1
MIC 101	Introductory Microbiology	½
PTH 166	Surgical Pathology	½
PTH 196	Student Autopsy Seminar	½
PTH 177	Neonatal and Pediatric Pathology	½
Elective*		½

*Electives may be chosen from courses offered by the Department of Pathology or from undergraduate junior or senior level courses approved by the department.

In addition to B.H.S. requirements, practical rotations during the summers are required for certification.

Prerequisites for Admission. Applicants must satisfy the general admission requirements for the Bachelor of Health Science degree. Selection is based on the applicant's academic record, test scores, experiences, and evidence of general aptitude and capability as indicated by the letters of recommendation. The Pathologists' Assistant Program does not require patient contact experience and accepts applicants who do not have past health-related experience.

Application Procedures. Applications must be completed by 1 May of the year for which admission is requested and must contain the following:

1. a completed Duke University Medical Center Allied Health application form, including a nonrefundable fee of \$30;
2. official transcripts from the armed forces and all high schools, colleges, or other academic institutions attended;

3. Scholastic Aptitude Test (SAT) scores from the College Entrance Examination Board; and/or the Allied Health Professions Admissions Test scores from the Psychological Corporation;
4. three letters of recommendation—one from a science professor and the remaining from individuals who have knowledge of the student's professional or educational qualifications.

All applicants will be notified by 1 June regarding admission to the program. Requests for further information and application forms should be directed to the Associate Director, Pathologists' Assistant Program, Department of Pathology, Duke University Medical Center, Box 3712, Durham, North Carolina 27710.

Special Expenses. Books, automobile registration, and health insurance will cost approximately \$300.

Financial Aid. Those students demonstrating need may be eligible for student loans and scholarships explained in the section on student aid. Assistance of approximately \$5,000–\$8,000 is also available in the form of part-time employment within the clinical laboratories of the Department of Pathology.

Physician Assistant

PHYSICIAN ASSISTANT PROGRAM ADMINISTRATION

Chairman: E. Harvey Estes, Jr., M.D., *Department of Community and Family Medicine*
 Program Director: Michael Hamilton, M.D., *Assistant Professor of Community and Family Medicine*
 Associate Director: Reginald D. Carter, Ph.D., PA-C, *Assistant Professor of Community and Family Medicine*
 Clinical Coordinator: Carl Toney, PA-C, *Clinical Associate*
 Educational Coordinator: Susan Edgman, PA-C, *Clinical Associate*
 Surgical Coordinator: Paul Hendrix, PA-C, *Medical Research Associate*
 Evaluation Coordinator: Barbara Patterson, PA-C, *Clinical Associate*
 Pediatrics Coordinator: Marcia Herman-Giddens, PA-C, *Clinical Associate*
 Clinical Site Coordinators: Joyce Nichols, PA-C; Pierce Lewis, PA-C; William Smith, PA-C; James Hill, PA-C; James Schmidt, PA-C

TEACHING STAFF AND FACULTY

Michael A. Hamilton, M.D., *Patient Assessment, Anatomy and Physical Diagnosis*; Reginald D. Carter, Ph.D., PA-C, *Anatomy and Physical Diagnosis, Medical Sciences*; Susan Edgman, PA-C, *Patient Assessment, Physical Diagnosis, Perspectives on Health, Medical Sciences, Behavioral Medicine*; Carl Toney, PA-C, *Patient Assessment, Physical Diagnosis*; Barbara Patterson, PA-C, *Patient Assessment, Physical Diagnosis*; Katherine Halpern, PA-C, *Anatomy and Physical Diagnosis*; Michael Burkhill, PA-C, *Anatomy and Physical Diagnosis*; Paul Hendrix, PA-C, *Anatomy, Fundamentals of Surgery*; Marcia Herman-Giddens, PA-C, *Introduction to Pediatrics*; Henderson Rourke, M.D., *Introduction to Pediatrics*; Leaf Diamant, M.A., *Psychodynamics*; Joseph Kertesz, M.D., *Psychodynamics*; Suydam Osterhout, M.D., *Microbiology*; Margaret Schmidt, MT(ASCP)SH, M.A.T., *Medical Technology*; Iris W. Long, MT (ASCP), M.A.T., *Laboratory Sciences*; Collins Baber, M.D., *Radiology*; James Wyngaarden, M.D., *Professor and Chairman, Department of Medicine, and Staff, Internal Medicine*; David Sabiston, M.D., *Professor and Chairman, Department of Surgery, and Staff, Surgery*; Samuel Katz, M.D., *Professor and Chairman, Department of Pediatrics, and Staff, Pediatrics*; Bernard J. Carroll, M.D., *Professor and Chairman, Department of Psychiatry, and Staff, Psychiatry and Behavioral Sciences*; Samuel Warburton, M.D., *Family Medicine*; Harvey Estes, Jr., M.D., *Community Medicine*

In addition to the above, the program calls upon teaching resources of affiliated community practitioners and members of the Departments of Medicine, Surgery, Obstetrics/Gynecology, and Pediatrics.

ADVISORY COMMITTEE TO THE PHYSICIAN ASSISTANT PROGRAM

The Advisory Committee to the Physician Assistant Program meets twice yearly to review and advise the program's administration concerning broad goals of the program. This committee consists of Duke faculty, community practitioners, nurses and nurse practitioners, health care consumers, health planners, and P.A. students and graduates.



In 1965 Duke University Medical Center began an innovative program designed to prepare highly educated and well-trained assistants for physicians. The program originated when clinicians at the Medical Center realized that they could enhance their productivity by safely and effectively delegating many of their tasks and responsibilities to nonphysicians, primarily ex-military corpsmen with previous health-related education and experience. Dr. Eugene A. Stead, Jr., then Chairman of the Department of Medicine at Duke, recognized the potential of the corpsmen experience and concluded that paramedical personnel might be trained to provide primary health care under the supervision of a physician. In developing the Department of Community and Family Medicine, Dr. E. Harvey Estes, Jr. foresaw that midlevel practitioners would help increase consumer access to health services, and extend the time and skills of the physician in providing competent, sensitive, and comprehensive health care.

The physician assistant possesses a broad understanding of medicine and health care. Men and women are chosen for the program on the basis of their humanistic perspective, demonstrated commitment to providing health care, and their academic potential.

On completion of the two-year program, graduates are prepared to assist in the evaluation and management of common health problems, including both acute self-limited problems and chronic illnesses such as hypertension and diabetes. Recognizing the intrinsic relationship between emotional and physical health, the program stresses competence in the exploration of psychosocial concerns. Graduates are expected to have a basic fund of knowledge pertaining to health needs of infants and children, young and middle-aged adults, and geriatric patients. Physician assistants also provide patient care services such as diagnostic and therapeutic procedures, wound suturing, cast application, and basic laboratory procedures.

Upon successful completion of the program, Duke University Medical Center awards the student a Bachelor of Health Sciences degree and a Physician Assistant Certificate.

Program of Study. The curriculum is twenty-three consecutive months in duration and is designed to provide an understanding of the rationale for skills used in physical diagnosis and problem assessment. It focuses primarily upon the common problems seen in ambulatory care settings, so that the student is able to utilize and understand the various diagnostic, therapeutic, and supportive measures used by the primary care physician. The first ten months are devoted to the basic medical and behavioral sciences and the remaining thirteen months to clinical training in a variety of practice settings. The rigorous curriculum requires people who have had college level education and experience in a health-related discipline.

The preclinical curriculum is integrated in such a way as to introduce the student to medical sciences as they relate to clinical problems. Learning strategies include self-instructional study guides, teaching patients, lectures, seminars, laboratories, and small-group encounters. Clinical medicine and patient evaluation are taught using the problem-oriented medical record format. The psychosocial aspects of clinical practice are emphasized as well as the physical aspects of disease processes.

As part of the clinical practicum students are required to take rotations in inpatient medicine, surgery/emergency services, family medicine, pediatrics, and obstetrics/gynecology. The final ten weeks of clinical training is spent away from Duke in a primary care setting.

Because the clinical teaching is carried out in many practice settings, students should plan on being away from the Durham area for part of their clinical experience.

Curriculum. Before proceeding into the clinical phase of the curriculum, students must satisfactorily complete the following:

Preclinical Schedule

<i>Fall Semester</i>		<i>Course Weight</i>
CFM 103	Medical Sciences for Clinical Practice I	1 ½
CFM 112	Anatomy and Physical Diagnosis I	½
CFM 114	Patient Assessment I	½
CFM 106	Psychodynamics I	1
CFM 101	Perspectives on Health	½
PTH 115	Clinical Diagnostic Procedures	<u>1</u>
		5
<i>Spring Semester</i>		<i>Course Weight</i>
SCFM 104	Medical Sciences for Clinical Practice II	1
CFM 113	Anatomy and Physical Diagnosis II	½
CFM 115	Patient Assessment II	½
CFM 107	Psychodynamics II	1
MIC 101	Introductory Microbiology	½
RAD 101	Introductory Radiology	½
SURG 101	Fundamentals of Surgery	<u>1</u>
		5
<i>Summer Term 1</i>		<i>Course Weight</i>
CFM 105	Introduction to Pediatrics	1

After satisfactory completion of all basic science courses, students must complete the following:

Clinical Schedule

MED 150. General Medical Inpatient Service	2 courses	8 weeks
SURG 150. General Surgery	1 course	4 weeks
SURG 151. Outpatient/Emergency Surgical Service	1 course	4 weeks
OBG 150. Obstetrics and Gynecology	1 course	4 weeks
PED 150. Pediatrics	1 course	4 weeks
CFM 151. Family Medicine	1 course	4 weeks
CFM 152. Behavioral Science	<u>1 course</u>	<u>4 weeks</u>
	8 courses	32 weeks

In addition to the above courses required for the B.H.S. degree, students must complete:

Four elective courses required for certificate

Subtotal: 44 weeks

Final Preceptorship†

10 weeks

Total: 54 weeks

†This rotation is taken only during the summer of the last year.

Prerequisites for Admission. To be eligible for the Bachelor of Health Sciences program, applicants must complete by 15 January (the application deadline) 60 semester-hours of college credit from an institution whose credits are transferable to Duke University and which include one English course, one humanities course, three courses in the social sciences, and three courses in the natural sciences (two of which must be chemistry and biology). Of equal importance to the academic requirement is a minimum of one year of health care experience. This experience, the minimum to be completed by 15 January, should involve direct patient contact and may be gained as a nurse, patient care assistant, military corpsman, or in other related fields such as medical technology, physical therapy, and counseling in health-related fields.

Application Procedures. Application materials and course bulletins are mailed to prospective applicants from 1 June through 15 December each year. Applications are accepted by the University no earlier than 1 September and no later than 15 Jan-

uary for the new class which enters in late August each year. Applications must contain:

1. a completed Duke University Medical Center Allied Health application form, including a nonrefundable fee of \$30;
2. official transcripts from all colleges or other academic institutions attended;
3. Allied Health Professions Admission Test scores of the Psychological Corporation, 304 East 45th Street, New York, New York 10017;
4. Scholastic Aptitude Test Scores of the College Entrance Examination Board, if already taken;
5. three letters of recommendation, to include one from an immediate supervisor and one from a physician with whom the applicant has worked.

Selection Factors. The program has a specific interest in enrolling students from diverse social, ethnic, and educational backgrounds. Emphasis is placed upon personal maturity, quality of health care experience, dedication to the health field, and intellectual capacity. Information submitted by each applicant is carefully reviewed by the Committee on Admissions, and selected applicants are invited to Duke University for personal interviews. These interviews usually take place in mid-March of each year; students are chosen from among those interviewed. All applicants will be notified by 15 April regarding admission to the program. Requests for application forms and information should be directed to the Coordinator of Admissions, Physician Assistant Program, P.O. Box CFM-2914, Duke University Medical Center, Durham, North Carolina 27710.

Special Expenses. Books for the program will cost approximately \$700, equipment \$400, and uniforms \$100.

Financial Aid. The financial aid office works closely with students to secure loans. Due to the limited amount of money available, requests are considered individually and approved on the basis of financial need. Part-time employment for students is available in many areas of the Medical Center. Frequently such employment can net students about \$200 per month and yet not jeopardize their education. Students must comply with the academic schedule and are prohibited from working more than twenty hours per week.

Courses of Instruction

Courses numbered from 150 through 189 either list specific prerequisites or have as prerequisite the completion of the junior year in one of the programs.

Double numbers separated by a hyphen indicate that the course is a year course and must normally be continued throughout the year if credit is to be received.

ANATOMY

ANA 101. Basic Human Anatomy. A lecture-laboratory discussion course that examines human morphology and the fundamental relationships among the neurologic, musculoskeletal, cardiovascular, gastrointestinal, respiratory, renal, and reproductive systems. The course includes cadaveric presentations of every major region of the human body. Intended primarily for students in allied health programs. One course. *Cartmill, Hylander, and staff*

ANESTHESIOLOGY

ANE 100. Antomy and Physiology. A lecture and discussion course that examines the structure and function of human cells, tissues, and organs with emphasis on the implications for anesthesiology. This course also includes the appropriate pathology that may influence anesthetic management. Three courses. *Glenn, Tobias, and Hall*

ANE 105. Biochemistry and Physics of Anesthesia. The lecture-discussion format is used to present the principles of chemistry and physics that are applicable to the practice of anesthesia. Topics included are matter and atomic structure, molecular motion, energy, gases and gas laws, fluids and fluid flow, volatile agents and vaporizers, organic chemistry, biochemistry, fire and explosion, electrical hazards, and other topics. One course. *Tobias, Osborne, and Tacchi*

ANE 110. Cardio-Respiratory Physiology. A comprehensive presentation of respiratory and related cardiovascular physiology which is designed to provide amplification and reinforcement of ANE 100. One course. *Lumb*

ANE 120. Fundamentals of Anesthetic Practice I. This course provides the student with a basic knowledge of narcosis, uptake and distribution of anesthetic agents, and patient management during and after anesthesia. Anesthetic risk, accidents, and sequelae are integrated into the theory, operation, and maintenance of anesthetic equipment. Additionally, anesthetic techniques including endotracheal procedures, ventilators, positions, hypothermia, and monitoring are presented utilizing lectures, demonstrations, and practice. Also discussed are the legal, historical, and ethical aspects of anesthesiology. Two courses. *Glenn, Stump, and staff*

ANE 130. Pharmacology of Anesthesia. This course presents the basic principles of pharmacology necessary to understand the uptake, distribution, metabolism, and elimination of anesthetic agents and adjunct drugs that are used in the practice of anesthesia. Drug interactions and adverse drug reactions are also presented. The descriptive pharmacology of the drugs utilized in anesthesia and by the patient before, during, and after are also discussed according to their classifications, i.e., cholinergic drugs, narcotics, local anesthetics, neuromuscular blockers, cardiac drugs, etc. Two courses. *Stump*

ANE 150. Introduction of Clinical Anesthesia. An orientation to the operating rooms and the anesthesia department at Duke University Medical Center. Early in this course the student is primarily an observer of the daily routine and the administration of anesthesia. The student is also exposed to related areas in his/her orientation to the field of anesthesiology (recovery room, respiratory therapy, and obstetrics). As the course concludes the student participates in the administration of anesthesia to surgical patients. One course. *Staff*

ANE 121-122. Fundamentals of Anesthetic Practice II and III. This course presents timely topics and issues in anesthesiology as well as a review of basic anesthesia theories and principles. Topics include: blood gas interpretation, monitoring techniques, new agents and techniques, anesthetic management for common and uncommon diseases. This is a continuous sequence which covers the entire academic year. One course each. *Staff*

ANE 170-177. Clinical Anesthesia Rotations. The student rotates through the various surgical services while administering anesthesia under the constant supervision of the anesthesia staff. During eleven rotations the student builds his or her skill in patient management, anesthetic techniques, and equipment. The rotations are orthopaedics, neurosurgery, cardio-thoracic, general surgery, obstetrics, gynecology, urology, plastic-maxillofacial, otolaryngology, ophthalmology, and pediatrics. Two courses each. *Staff*

COMMUNITY AND FAMILY MEDICINE

CFM 101. Perspectives on Health. An overview of factors which impact the planning, delivery, and utilization of health care services. Issues considered include cultural expectations, behavioral characteristics of illness, political and economic

implications of health policy, epidemiological methods, distribution of resources, and ordering of priorities. Research and techniques of health education and preventive medicine are discussed as part of a critique of the present acute care, specialty oriented system. Time will be spent discussing the role and impact of the physician assistant in the health care system. One-half course. *Edgman and staff*

CFM 103-104. Medical Sciences for Clinical Practice. A system of self-instructional tutorials, enrichment sessions, and clinical correlations provide the student an opportunity to learn the rationale underlying the delineation and management of common clinical problems seen by primary care practitioners. Presentations in anatomy, physiology, biochemistry, pathology, and pharmacology are unified and integrated with clinical medicine, using an organ systems approach. The course provides the student with an interesting, intelligent, and pragmatic account of modern concepts in medicine and medical sciences. Three courses. *Carter, Edgman, Hamilton, and staff*

CFM 105. Introduction to Pediatrics. The purpose of this course is to introduce students to clinical problems commonly seen in ambulatory pediatrics. Through lectures and demonstrations, students learn basic concepts and practical approaches to the maintenance of health and the management of illness in infants and children. In small group sessions, students develop skills necessary to assess the normal development of children and to define an appropriate data base for specific clinical problems. Physical assessment and diagnostic techniques are demonstrated. The psychological, pharmacological, and nonpharmacological management of pediatric patients are discussed. This course is taught by members of the Department of Pediatrics. One course. *Rourk and Herman-Giddens*

CFM 106-107. Psychodynamics. This course presents an extensive view of human behavior while concurrently developing skills that facilitate interpersonal awareness and psychological intervention. Didactic information is put into practice as students learn interviewing and counseling skills. The understanding of self is encouraged as the first step toward the helping of others. This course is divided into four subunits: psychiatry; communications, counseling, and interviewing; human growth and development and behavioral medicine. Two courses. *Kertesz, Diamant, Edgman, and staff*

CFM 112-113. Anatomy and Physical Diagnosis. This course is taught by the program staff and clinicians from the Department of Surgery and Medicine. Students learn functional and applied anatomy as it applies to physical diagnosis and common clinical findings. Course content is sequenced to correlate with material presented in the Medical Sciences for Clinical Practice Course (CFM 103-104). Teaching methods for the anatomy component of the course include lectures, cadaver prosections, and audiovisual materials. Physical diagnosis is taught primarily through supervised practice of physical diagnosis skills. One course. *Hamilton, Hendrix, Carter, Edgman, Patterson, Toney, and staff from the Departments of Medicine and Surgery*

CFM 114-115. Patient Assessment. This course is taught by the program staff and clinicians from the Department of Medicine. Students learn and practice skills in medical interviewing and physical assessment, clinical decision making, and the accurate and efficient recording and presentation of clinical information. Teaching methods include lectures, small group seminars, role playing, and the supervised examination of patients. One course. *Hamilton, Edgman, Toney, Gordon, and staff from the Department of Medicine*

CFM 150. General Community Medicine. During this rotation students spend time with physicians in community practice, observing and participating in both office-based and hospital care. Students gain experience in doing both problem-specific and complete evaluations and through follow-up visits have an opportunity to mon-

itor the results of therapy. Students learn to appreciate the impact of a patient's total environment on their health status. One or two courses. *Staff*

CFM 151. Family Practice. A four-, or eight-week clinical experience surveying the components of family practice, including emotional conflicts and interpersonal relationships with the patient and other members of the family unit. Through experience in interviewing and examining patients, the student is exposed to the multifaceted approach of understanding and treating physiologic and sociologic components of disease processes. In this situation, an understanding of the common diseases treated by primary care practitioners and the aspects of the unique relationship a physician's associate experiences with private patients, their physician, and other health team members is developed. One or two courses. *Warburton and staff*

CFM 152. Behavioral Science. A four-week clinical experience in behavioral sciences. Four days each week are spent at a facility involved in the treatment of behavioral disorders (i.e., community psychiatry, inpatient psychiatry, outpatient psychiatry, alcoholism treatment, etc.). Students learn and participate in the diagnosis and treatment of patients cared for at that site. One day each week is spent in a seminar reviewing interviewing skills and selected topics related to the patients seen at the various sites. One course. *Kertesz and staff*

CFM 180. Final Preceptorship. This rotation is required of all students during the final ten weeks of their training and provides a transition between the role of the student and graduate physician's associate. Students are encouraged to select a preceptor in the area of their anticipated employment and, during this extended period of time, to explore the tasks and team aspects of functioning as a midlevel practitioner. Students will provide health services consonant with their backgrounds, clinical experiences, and the needs of the particular practice setting. Required for certificate. Two and one-half courses. *Toney, Hamilton, and staff*

CFM 191. Independent Study. This special four-week course enables students to select individually with program administrators a series of objectives and to develop a program that can reasonably be expected to achieve those objectives. One course. *Estes, Hamilton, and staff*

MEDICINE

MED 150. Inpatient Medicine. An eight-week full-time required clinical rotation in which the student learns to apply basic medical knowledge to the problems and situations encountered on an inpatient service. By collecting a data base, formulating a complete problem list, participating in daily rounds, and participation in the management of patient problems, the student develops an awareness and understanding of the multiple aspects of disease processes and becomes familiar with therapeutic regimen and dispositions relative to specific disease states. The student will present the data base of each new patient to the supervising physician or attending rounding physician in a coherent, concise fashion. Two courses. *Staff*

MED 151. Outpatient Medicine. During this rotation, the student learns to apply basic medical knowledge to the common problems and situations encountered on an outpatient/emergency service. Experience may include long-term follow-up of patients with chronic disease, emergency triage and management, and evaluation of acute self-limited problems. This rotation occurs in an institutional as opposed to a private setting. One or two courses. *Staff*

MED 152. Intensive Care. A four-week rotation that acquaints the student with the acute and intensive care required for patients who have undergone major and



complex surgical procedures, suffered massive and severe trauma, cardiorespiratory collapse, or other life-threatening medical crises. Emphasis is placed on ventilatory assistance, cardiopulmonary resuscitation, fluid and electrolyte replacement, and acid-base balance under resident physician supervision. One course. *Staff*

MED 153. Cardiology. During the rotation students will become familiar with the presentation, evaluation, and management of cardiovascular disorders, including acute and chronic problems. Students will gain experience performing the medical history and physical examination and will learn appropriate diagnostic procedures and therapeutic regimens, including drug therapy, alterations in life patterns (smoking, diet, exercise, etc.), and surgical intervention. One or two courses. *Cardiology staff*

MED 155. Endocrinology. A four- or eight-week rotation designed to acquaint the student with endocrinological diseases. The emphasis is placed on obtaining the defined endocrine data base and appropriate treatment of the disease. Students attend all daily rounds and conferences while on the service. They are taught the indications, limitations, and methods of performing diagnostic procedures including: glucose, tolbutamide, and arginine tolerance tests; thyroid function tests; and urinary steroid determinations. Students help educate patients with endocrine diseases about their disease processes, diagnostic evaluations, and therapies. One or two courses. *Endocrinology staff*

MED 156. Gastroenterology. During this four- or eight-week rotation students study the diagnosis, pathophysiology, and essentials of therapy of various gastroenterologic problems. They learn to perform and interpret the following diagnostic procedures: nasogastric intubations and gastric analyses (both with and without fluoroscopy), secretin tests, rectal and small bowel biopsies, proctoscopies, sigmoidoscopies, and gastroscopies. They also learn to care for endoscopic and biopsy instruments and biopsy specimens. One or two courses. *Gastroenterology staff*

MED 157. Hematology-Oncology. During this four- or eight-week rotation the students become familiar with the presentation of hematologic and oncologic problems, including many which are serious and life-threatening. A major objective for the student will be learning to relate supportively to the feelings and needs of terminally ill patients. The student will also gain experience with various diagnostic procedures, including white cell differential, bone marrow aspiration, lumbar puncture, paracentesis and thoracentesis. Students will become familiar with the principles of blood transfusion. One or two courses. *Hematology staff*

MED 159. Pulmonary Medicine. A four- or eight-week rotation that provides an indepth exposure to patients with respiratory conditions. The problems encountered by patients who have respiratory ailments are studied in detail as are the associated special history and physical examination techniques, diagnostic and therapeutic procedures. The student participates in daily rounds and teaching conferences on respiratory diseases and gains a knowledge of the therapeutic regimen, their indications, availability, reliability, and limitations in the treatment of respiratory and allergic diseases. One or two courses. *Pulmonary staff*

MED 160. Nephrology. During this four- or eight-week rotation, the student learns to gather and record information in a problem-oriented manner about patients with renal and hypertensive diseases. The student becomes able to recognize the effects of disease, therapy, and education on the patient's course and plays a major role in patient education. The fundamentals of renal function, urinalysis, radiography of the chest, urinary system and bones, and the principle of dialysis are covered. One or two courses. *Nephrology staff*

MED 161. Neurology. On this rotation, students learn about the presentation, evaluation, and management of patients with neurologic problems. The student de-

velops an understanding of specialized history and physical techniques and diagnostic procedures, including electroencephalography, brain scan studies, pneumoencephalography, and central nervous system radiologic studies. Students also learn to relate supportively to patients whose symptoms may be frightening and/or have a serious prognosis. One or two courses. *Neurology staff*

MED 162. Rheumatology. This course provides the student with an indepth exposure to rheumatologic disease. Students gain insight into the psychosocial adjustments necessitated by chronic, potentially disabling disease. Students also gain familiarity with diagnostic procedures, therapeutic regimens, and learn how to do a meticulous and thorough joint examination. One or two courses. *Rheumatic and genetic diseases staff*

MED 163. Dermatology. During this rotation students gain familiarity with major classes of dermatologic diseases, ranging from acute self-limited problems to malignant conditions. Sensitivity to the negative effects of cosmetic disfigurement is stressed. Students gain experience with common diagnostic procedures and courses of treatment. One or two courses. *Tindall and dermatology staff*

MED 165. Clinical Infectious Disease. During this four-week rotation, the student learns to approach patients presenting with infectious diseases, to gather a data base from them, and to understand the manifestations of the illnesses and the rationale for therapy. One course. *Staff*

MED 191. Independent Study. This course is intended to allow students with particular interests in an area of internal medicine to structure a need-specific learning experience. Independent studies are arranged with the program staff and appropriate clinical faculty. One or two courses. *Staff*

MICROBIOLOGY

MIC 101. Introductory Microbiology. An introduction to diagnostic microbiology covering such topics as microbial morphology, staining characteristics, growth requirements, diagnostic tests, and antibiotic susceptibility testing. The clinical aspects of such subjects as pyogenic cocci, gram negative sepsis and nosocomial infection, meningitis, venereal disease, enteric infection, anaerobic pathogens, tuberculosis, mycotic diseases, viral infections, and the use of antibiotics are also included. One-half course. *Osterhout*

OBSTETRICS AND GYNECOLOGY

OBG 150. Obstetrics/Gynecology. During this rotation students learn about the health, needs, and concerns of women. Students learn about pregnancy, including prenatal care and management of labor and delivery. The student is expected to be fully familiar with the normal course of pregnancy and with common complications in order to provide educated and sympathetic support for the prospective mother. Students will also gain experience with common gynecologic concerns, including cancer detection, abnormal menstruation and bleeding, infections, and sexual dysfunction. Familiarity with the effectiveness, indications, and contraindications of various forms of contraception is a further objective. One or two courses. *Staff*

OPHTHALMOLOGY

OPH 150. Ophthalmology. This is a four- or eight-week rotation reviewing the major ophthalmologic disease. Through lectures, teaching rounds, and learning special history and physical examination techniques, the student develops an expertise in determining visual fields, visual acuity, and oculotonometry. The principles of refraction and the many medical and surgical therapeutic regimens available for treating

ophthalmologic disorders are included. The student is also required to participate in the routine care of ophthalmologic inpatients and outpatients. One or two courses. *Staff*

PATHOLOGY

PTH 102. Histologic Technique and Interpretation. The student is presented a wide background in tissue and cell morphology and physiology. Emphasis is placed on cellular and subcellular structures which help develop tissue types. A synopsis of current concepts of ultrastructure is related to those of light microscopy. Students learn to evaluate and interpret, under light microscopy, those features which distinguish one tissue from another. The interrelationships between cytology, histology, and organology is stressed. One course. *Broda and Mazzeo*

PTH 107. Human Pathology. The general categories of disease processes will be presented through specific diseases of organ systems. Diseases will be selected for presentation because they epitomize individual etiologic categories, and/or because they occur so commonly in the general patient population that it is important for the student to understand how the abnormal processes are translated into clinical events. One course. *Broda and Mazzeo*

PTH 110-111. Systemic Pathology. Disease processes are studied via methods and techniques utilized in organ system dissection as they pertain to autopsy pathology specimens. Clinicopathologic correlation is stressed utilizing gross and microscopic examples of disease processes, case studies, lectures, and demonstrations. One course. Prerequisites: PTH 102, 107, 200. *Staff*

PTH 115. Clinical Diagnostic Procedures. Students develop skills for performing routine hematologic, urinary, and microbiological procedures suitable for emergency or office/clinic practice. Lectures and discussions are concerned with clinical interpretation and appropriate applications of laboratory data and physiologic derangements which frequently produce abnormal laboratory values. Basic principles of electrocardiography are presented also. A \$50 laboratory fee is required. One course. *Widmann, Schmidt, and Long*

PTH 160. Autopsy Technology. During this eight week on-the-job training period, students are introduced to autopsy dissection techniques and general anatomic pathology protocol. These include evisceration, organ block dissection, tissue preparation for histology, microscopic evaluation, and final protocol completion. Prerequisites: PTH 102, 107, 164. One and one-half course. *Broda and Mazzeo*

PTH 161. Medical Photographic Technology. This course offers the student, via lecture and practical assignments, basic photographic theory and principles including, but not limited to, camera handling techniques, composition, exposure determination, and lighting with electronic flash. The student will be given the opportunity to become proficient in the photography of specimens both in situ and in display, and also in photomicrography. The emphasis in this course shall be on practical assignments. One course. *Mitchell and staff*

PTH 162. Laboratory Management and the Computer. This course is offered in response to the increasing role of the pathologists' assistant in laboratory supervision. Students will be exposed to various aspects of laboratory organization and administration including personnel supervision, budgeting, accounting, and quality control. In addition, students will be introduced to the theory, concept, and practice of data processing as it relates to the anatomic pathology laboratory. The development of a basic vocabulary and the understanding of data processing terms and concepts will be stressed. One course. *Broda and staff*

PTH 164. Clinical Diagnostic Methods. The course is designed to instruct the student in technical and clinical laboratory procedures which are utilized in the diagnosis of disease. Emphasis is placed upon selection and interpretation, rather than the performance of the various procedures. One course. *Staff*

PTH 165-166. Surgical Pathology. During this two-semester course, students are instructed in gross pathology as it pertains to surgical specimens. Gross and microscopic findings are correlated with clinical observations while the student learns the procedural handling of selected specimens. The program of study will consist of lectures, demonstrations, and laboratory work. Two courses. Prerequisites: PTH 107, 110, 200. *Vollmer and staff*

PTH 167. Autopsy Practicum. The course is designed as a practical rotation on the autopsy service, the student participating in necropsy dissections with the resident staff. Emphasis is placed on student participation in both the technical and academic aspects of the autopsy. Also required are attendance and participation in all departmental conferences concerning gross autopsy pathology. One and one-half courses. Prerequisites: PTH 107, 160, 200. *Adams and Lewis*

PTH 177. Neonatal and Pediatric Pathology. This course is designed to teach the student how to perform routine and special autopsy and surgical pathology techniques necessary to delineate pathologic processes in the neonatal and pediatric age group. This will be accomplished by lectures, autopsy dissection, and protocol completion on selected pediatric autopsies, and participation in departmental pediatric autopsy conferences. Prerequisites: PTH 160, 167, 200. Half course. *Bradford and staff*

PTH 183. Special Autopsy Techniques and Procedures. The course is designed to teach the special technical skills used in modified necropsy procedures (i.e., en bloc cervical spine removal, postmortem coronary arteriography, en bloc pituitary-sella turcica). Emphasis is placed on the student becoming proficient at techniques which demonstrate or preserve various aspects of gross pathology. The program of study will include seminars, demonstrations, and preparation of museum teaching specimens. One course. Prerequisites: PTH 107, 160, 200. *Broda and Mazzeo*

PTH 191. Independent Study. This course is intended to give students an opportunity to research and/or participate in pathology specialty areas of their interest. Students can pursue individual research projects or arrange laboratory preceptorships under the direction of appropriate faculty and staff. Prerequisites: PTH 107, 110, 200. One or two courses. *Staff*

PTH 196. Student Autopsy Seminar. Students share interesting autopsy and surgical pathology cases encountered in their practical rotations by making lecture-slide presentations to their peers. Emphasis is placed on learning through literature research and experience is provided in giving oral presentations. One-half course. Prerequisites: PTH 165, 167. *Broda and Mazzeo*

PTH 200. Pathology. Fundamentals of pathology are presented by correlating gross and microscopic material to illustrate the structural changes in disease. Lectures consisting of broad concepts of disease processes are presented by senior faculty and conferences with small groups of students are held under the guidance of staff members. Etiology and pathogenesis of disease as well as the experimental approach are emphasized for the purpose of correlation with clinical disease. In addition to group work, conferences are scheduled to discuss problems derived from autopsies. Students are required to collaborate in postmortem studies and present cases in clinical-pathologic conferences under the direction of the staff. Two courses. Prerequisites: ANA 101; PTH 102, 107. *Staff*

Elective Courses

Qualified senior students, in the Pathologists' Assistant Program, who have successfully completed PTH 107 and PTH 200 may choose elective classes in specialized areas of pathology with the approval of the faculty member responsible for the course. In addition, selected courses from the Medical Technology Program may be elected subject to faculty approval.

PEDIATRICS

PED 150. Community Pediatrics. The major objective of this rotation is to provide students with an overview of community pediatric practice. Students will gain familiarity with normal growth and development and developmental evaluation, pediatric preventive medicine, and evaluation and management of common childhood illnesses. Special emphasis is placed on communication skills and relating sensitively to both children and parents. Each student will spend time in the newborn nursery and be involved with hospitalized patients. One or two courses. *Rourk, Herman-Giddens, and staff*

PED 152. Intensive Care. A four-week rotation that acquaints the student with the acute and intensive care required for patients who have undergone major and complex surgical procedures, suffered massive and severe trauma involving multiple organ systems, or experienced sudden cardiorespiratory collapse or other life-threatening medical crises. Emphasis is placed on ventilatory assistance, cardiopulmonary resuscitation, fluid and electrolyte replacement, and acid-base balance under resident physician supervision. Prerequisite: PED 150. One course. *Staff*

PED 153. Pediatric Chest and Allergy. During this four- or eight-week rotation the student is taught to obtain a complete history and physical examination with emphasis on the allergy data base and the structure of the family. Students gain understanding of the impact of chronic illness on children and their families. They gain an understanding of home care programs and are able to alter them to fit a family's ability and resources. The student carries out appropriate diagnostic procedures and assesses the results for children with pulmonary disease. One or two courses. *Staff*

PED 154. Full-Term Nursery. During this four- or eight-week rotation the student learns to collect the maternal history accurately and completely; to recognize those maternal conditions imposing risks on the full-term infant; to collect samples for newborn screening laboratory exams; to examine a full-term infant and distinguish those who are abnormal from those who are normal; and to give cogent instructions to mothers and fathers regarding home care of the infant. One or two courses. *Staff*

PED 191. Independent Study. This rotation allows students with a particular interest in an area of pediatrics to construct their own need-specific learning experience. PED 191 is arranged with the program staff and appropriate clinical faculty. One or two courses. *Staff*

PHYSIOLOGY

PHS 102. Basic Human Physiology. A lecture course in which the functions of major organ and tissue systems and their contributions to total body homeostasis in health and disease are discussed. The interpretation of laboratory findings in view of known physiological parameters and the communication, using appropriate terminology, of these findings to physicians and other health care professionals as well as the patient's family is stressed. One course. *McHale*

RADIOLOGY

RAD 101. Introductory Radiology. A review of roentgen anatomy and an introduction to the uses of radiology in the care of patients. Students learn the basic clinical concepts and develop skills in performing basic scanning and routine radiographs. One-half course. *Barber and staff*

SURGERY

SUR 101. Fundamentals of Surgery. This course has been recently redesigned to better focus on the needs of P.A.'s in primary care settings. While including the basic concepts needed for P.A.'s to function well in a major surgical setting, the course emphasis is on building expertise in the areas of minor surgical techniques, emergency procedures, and the surgically related skills needed in general medicine. Included in the lecture, laboratory, and skill sessions will be a wide variety of topics from anesthesia and asepsis to venipuncture. The students will learn first assisting, suturing, casting, various intubations, and will be certified in Basic CPR. The final eight weeks of the course will emphasize work in the Animal Surgery Laboratory. One course. *Hendrix and staff*

SUR 150. General Surgery. A four or eight-week rotation that exposes the student to a great variety of clinical problems, crossing, at times, many so-called specialty lines. Basic surgical principles, as well as insights into many of the surgical specialties, can be learned on this service. Preoperative diagnostic principles and postoperative management are emphasized. The most attractive feature of the rotation is the great diversity of surgical problems encountered. One or two courses. *Staff*

SUR 151. Surgical Outpatient/ER. During this four-week rotation, students become familiar with the evaluation and management of surgical problems of the ambulatory patient. In the emergency room, students gain experience in the initial evaluation of potential surgical conditions, particularly abdominal pain. Students learn to perform problem specific examinations and have an opportunity to evaluate patients on return visits. One course. *Staff*

SUR 152. Intensive Care. During this experience the student learns to: recognize patients requiring intensive medical care; operate and maintain life-monitoring equipment; understand and evaluate fluid electrolyte replacement and acid-base balance; and administer cardiopulmonary resuscitation and ventilatory assistance. This experience may be gained on the respiratory care unit, medical care unit, intensive care nursery, surgical acute care unit, and in pulmonary function-inhalation therapy. One or two courses. *Staff*

SUR 153. Cardiothoracic Surgery. During this rotation, the student learns to perform a detailed history and physical examination with special emphasis on the cardiothoracic system. With special help from the resident and senior staff and through reading, the student should be able to appreciate special diagnostic procedures such as angiograms, pulmonary function studies, etc. In the operating room, the student will assist and follow the conduct of various open-heart and other major thoracic procedures. The resident, senior staff, and student will participate in the management of complex problems such as various arrhythmias, shock, fluid and electrolyte imbalance. One or two courses. *Cardiothoracic surgery staff*

SUR 155. Surgical Acute Care Unit. During this rotation the student is acquainted with the postoperative care of patients who have undergone surgical procedures or suffered massive and severe trauma involving multiple organ systems. Special emphasis is centered on ventilatory assistance problems, open-heart cases, neurosurgical problems, and massive trauma cases. The variety of the patients and



the diversity of the problems that exist on the unit give the student a broad insight into surgical postoperative management. The student should strive for an understanding of the pathophysiology and physiology. One or two courses. *Cardiothoracic division staff*

SUR 156. Otolaryngology. During this rotation students will learn to evaluate problems related to the ear, nose, and throat. Experience will include both ambulatory and hospitalized patients. Students will gain familiarity with various diagnostic and therapeutic procedures and will have an opportunity to follow patients over a period of time. One or two courses. *Division of Otolaryngology and staff*

SUR 157. Plastic Surgery. During this course students gain familiarity with patients requiring plastic repair including burn patients, and patients with facial anomalies and maxillofacial neoplasms. The course objectives include an understanding of preoperative and postoperative care, recording the initial history and physical examination, and ordering indicated laboratory tests and studies. It is hoped that the student will learn to respond sensitively to the emotional needs of this group of patients. One or two courses. *Division of Plastic Surgery and staff*

SUR 160. Urology. During this rotation, students learn about urologic disease. Students participate in the care of clinic and hospitalized patients with common urologic problems and take part in initial evaluations, diagnostic procedures, surgery, and acute and long-term follow-up care. One or two courses. *Division of Urology*

SUR 161. Neurosurgery. During this eight-week rotation the student is provided with a working understanding of the problems unique in the diagnosis, treatment, and management of the neurosurgical patient. The student may gain experience in the operating room by assisting with the patient, with instrumentation, and with the operative procedures. A working knowledge is gained of diagnostic techniques such as carotid arteriograms, electroencephalograms, ventriculograms, spinal taps, etc. Experience and knowledge in emergency room techniques and management of acute neurosurgical injuries (GSW, blunt head trauma, acute quadriplegia, hemiplegia, etc.) is included. One or two courses. *Division of Neurosurgery*

SUR 162. Orthopaedic Surgery. Students gain familiarity with the evaluation and management of common orthopaedic problems at the primary care level, including soft tissue injuries, fractures, arthritis, and low back pain. Students will learn the mechanism for applying different types of traction, how to apply splints and casts, and how to provide emergency care for acute trauma. One or two courses. *Orthopaedic Division*

SUR 191. Independent Study. This rotation allows students with a particular interest in an area of surgery to construct their own need-specific learning experience. SUR 191 is arranged with the program staff and appropriate clinical faculty. One or two courses. *Surgical staff*

Graduate Degree Programs



The Graduate School of Duke University awards a Master of Health Administration degree to students who complete the program in health administration and a Master of Science degree to students who complete the program in physical therapy. Both health administration and physical therapy are departments in the Graduate School and additional information, including courses of instruction, may be found in the Graduate School bulletin which is available through the Office of Admissions, Graduate School, Duke University, Durham, North Carolina 27706. Graduate programs are also integral parts of Duke University Medical Center.

Health Administration

Professors: James P. Cooney, Jr., Ph.D., *Chairman*; E. Harvey Estes, M.D.; B. Jon Jaeger, Ph.D.; David G. Warren, J.D.

Associate Professors: David J. Falcone, Ph.D.; Louis E. Swanson, A.B.

Assistant Professor: Donald S. Smith, M.H.A.

Associate: Douglas Henderson-James, M.H.A.

Adjunct Professors: Arnold D. Kaluzny, M.H.A.; Robert E. Toomey, LL.D.; Edward L. Walls, Jr., Ph.D.

Adjunct Assistant Professors: David B. Adcock, J.D.; Samuel C. Brown, M.E.A.; David L. Cusic, M.H.A.; William J. Donelan, M.H.A.; Debbie Freund, Ph.D.; William H. Johnston, B.B.A.; Williams E. Wilkinson, Ph.D.; Robert G. Winfree, M.A.; Duncan Yaggy, Ph.D.

Lecturers: Robert J. Sullivan, Jr., M.D.; W. Edward Hammond, Ph.D.

The Department of Health Administration offers a four-semester, sixteen-month graduate program leading to the Master of Health Administration degree, and participates in selected joint-degree programs.

The M.H.A. program prepares individuals for management careers in complex health care organizations such as multihospital systems and academic medical centers.

The curriculum is rigorous, emphasizing quantitative decision making, statistics, operations research, financial management and accounting, public policy, health law, and organizational behavior.

One class of approximately forty is admitted each year, to start in September. Admission is highly competitive, with many applications for each student enrolled. Selection is based on previous academic and professional work, Graduate Record Examination scores, recommendations, and personal interviews conducted on campus. Only applicants who show potential for demanding graduate study and leadership in the health field are selected. For further information write to the Admissions

Coordinator, Department of Health Administration, Box 3018, Duke University, Durham, North Carolina 27710.

Tuition and Expenses. The 1983-84 academic year tuition for students enrolled in the health administration program is approximately \$6,800 for first-year students and \$5,800 for second-year students. Estimated cost for the two-year program is approximately \$24,750, including tuition and living expenses. Part-time students pay one-half the academic year tuition rate.

Financial Aid. A limited number of scholarships are available. All aid is on the basis of demonstrated financial need as described in the section on student aid in the chapter, "General Information."

Physical Therapy

Professor: Robert C. Bartlett, M.A., *Chairman*

Associate Professors: Eleanor F. Branch, Ph.D., *Director of Graduate Studies*; Elia E. Villanueva, M.A.

Assistant Professors: Grace C. Horton, B.S.; Pamela W. Duncan, M.A.C.T.; Steven G. Nelson, Ph.D.

Assistant Clinical Professors: Elaine M. Eckel, M.A.; Mary Ellen Riordan, M.S.

Associate: Mary M. Huse, Ph.D.

Clinical Associates: James Bittinger, B.A.; Carl J. Smith, B.S.

Adjunct Assistant Professor: Marcia Roses, M.A.

Adjunct Associates: Hazel Adkins, M.A.; Gayle B. Ashworth, B.S.; Rebecca L. Craik, Ph.D.; Susan E. Harryman, M.S.; Lois Ann Hodges, M.A.; Michelle G. Komito, B.S.; Martha Propst, M.A.; Kathleen R. Riley, B.S.; Wadsworth D. Roy III, B.S.; Ann W. Shearer, B.S.; Ronald W. Sweitzer, M.S.; Julia H. Tolley, B.S.; Gail W. Vanderlaan, B.S.; Elizabeth T. Warren, B.S.; Judy A. White, B.S.

The Duke University Graduate Program in Physical Therapy, leading to the Master of Science degree, is a program for entry into the profession of physical therapy. The program is designed to provide a comprehensive foundation in the art and science of physical therapy, preparing individuals for clinical practice. Experiences in the areas of administration and research are also provided. Students may arrange their curricula to allow for the development of teaching skills.

Program of Study. The fully accredited program of study requires fifty-two credit units of graduate course work, research, clinical affiliation, or other equivalent academic experience, and is twenty-two consecutive months in length. Forty-one units of work must be in physical therapy, five units in designated courses in anatomy, and the remaining six units in electives in related fields. A research project is required which provides the opportunity to pursue a particular aspect of physical therapy in depth.

Prerequisites for Admission. Requirements for admission to the physical therapy program include a baccalaureate degree, completion of prerequisite courses, Graduate Record Examination (GRE) Aptitude Test scores, the filing of an application, and, upon invitation, a personal interview. In order to meet the closing date of 1 February for the initial receipt of an application, it is strongly recommended that the GRE be taken no later than the October test date. All supportive documents must be received by the Graduate School Office of Admissions by 1 March and only completed applications are forwarded to the Graduate Program in Physical Therapy. Only students for full-time study are accepted. State of residency does not influence admission policies or tuition costs.

Requests for applications and further information should be directed to the Director of Graduate Studies, Department of Physical Therapy, Box 3965, Duke University Medical Center, Durham, North Carolina 27710.

Tuition and Expenses. The 1983-84 academic year tuition for students enrolled in the Graduate Program in Physical Therapy is \$209 per credit unit. Estimated cost for

the two-year program is approximately \$25,600, including tuition and living expenses.

Financial Aid. All students are encouraged individually to seek sources of financial assistance. Loan money is available through the Duke University School of Medicine. Financial aid applications are mailed to students after acceptance into the program. Please refer to the section on student aid in the chapter, "General Information."

Certificate Programs



Duke University Medical Center has responded to the increased need for qualified individuals at all levels in the health care system by developing educational programs designed to equip people for a variety of positions. These programs, which vary in admission requirements and length of training, offer students both clinical and didactic experience. Graduates of these programs are awarded certificates.

Clinical Psychology Internship

The Division of Medical Psychology, Department of Psychiatry, Duke University Medical Center, offers internship training in clinical psychology to students who are currently enrolled in APA-approved Ph.D. programs in clinical psychology and who have already completed three years of graduate study. The program, approved by the American Psychological Association, provides experience in many contexts with a wide diversity of patients. Internship training provides experience in the traditional activities of clinical psychologists: assessment, consultation, psychotherapy, and research. Those successfully completing the requirements for internship will be awarded a Duke University Medical Center certificate. Requests for additional information and correspondence concerning admission to the program should be directed to the Director, Clinical Psychology Internship Program, Box 3895, Duke University Medical Center, Durham, North Carolina 27710.

Cytotechnology*

Professor: William W. Johnston, M.D., *Director, Cytotechnology Program*

Professor: Edward H. Bossen, M.D.

Assistant Professor: Sandra H. Bigner, M.D.

Associate: Patricia R. Ashton, A.B., CT(ASCP), *Program Director*

Teaching Staff: Rosiland M. Wallace, A.B., CT(ASCP), *Teaching Supervisor*; Susan P. Moore, B.A., CT(ASCP), *Instructor*

Progress in the early detection of cancer by the microscopic examination of smears of cell samplings, especially from the female genital tract, has resulted in the specialty of cytotechnology. The cytotechnologist deals with the technical and diagnostic aspects of exfoliative cytology. Graduates of the program are awarded a certificate and are eligible to take the certifying examination given by the Board of Registry of the American Society of Clinical Pathologists.

*This program will be inactive for the 1983-84 year.

Program of Study. The twelve-month program beginning in early September consists of two parts: the first half is primarily devoted to theoretical and practical exercises in the techniques of exfoliative cytology and interpretation of the clinical material; the last half is composed of laboratory training in all aspects of exfoliative cytology.

Prerequisites for Admission. All applicants shall have completed two years (sixty semester-hours or ninety quarter-hours) of academic education in an accredited college or university before being accepted into this school. This preparatory work must include a minimum of fourteen semester-hours or twenty-one quarter-hours of biology. These may include courses in general biology, bacteriology, parasitology, physiology, anatomy, histology, embryology, zoology, and genetics. An applicant presenting a baccalaureate degree from an accredited college or university must have completed the biology requirements before admission. Biology credits earned more than seven years prior to application must be updated by taking three additional semester credits related to cell biology within a period of time not to exceed twelve months prior to admission. Priority will be given to individuals with a Bachelor of Science or Bachelor of Arts degree or to ASCP registered medical technologists.

Application Procedures. Applications must be submitted by 1 April of the year for which admission is requested and must contain the following:

1. a completed application form including a \$30 nonrefundable fee;
2. official transcripts from all colleges or professional schools attended;
3. one copy of all transcripts must be submitted by the applicant to the National Accrediting Agency for Clinical Laboratory Sciences for approval;
4. two letters of recommendation from individuals acquainted with the applicant's educational or professional experience; and
5. a personal interview prior to final acceptance.

All applicants will be notified by 1 May regarding admission to the program. Requests for further information and application forms should be directed to the Program Director, Cytotechnology Program, Department of Pathology, Duke University Medical Center, Durham, North Carolina 27710.

Laboratory Fees. On notification of acceptance, students are required to pay a nonrefundable registration fee of \$25. This fee will be applied towards the year's course fee of \$1,250.

Financial Aid. See the section on student aid in the chapter, "General Information."

Electrophysiological Technology

Medical Director: Darrell V. Lewis, M.D.

Program Director: Linda Ollis, B.S., R.EEG T.

Clinical Coordinator: Linda Quinlivan, R.EEG T.

Professor: C. W. Erwin, M.D.

Associate Professor: Michael R. Volow, M.D.

Assistant Professor: Richard Weiner, M.D., Ph.D.

Instructional Staff: Neurology residents and laboratory staffs at Duke and the Durham VA Medical Centers and Epilepsy Centers

The Electrophysiology Technology Program is sponsored by the Division of Neurology, Department of Medicine, Duke University Medical Center. A major part of the course involves training in EEG (electroencephalography) technology. Other areas to which the student is exposed include evoked potentials, electrocardiographic technology, and electromyographic technology. Approximately ten students are accepted into the program in September. Upon successful completion of the twelve-month program, graduates are awarded a certificate and are eligible to take the certifying ex-

amination given by the American Board of Registration of Electroencephalographic Technologists.

Program of Study. The program consists of twelve months of classroom instruction and clinical training. Approximately two hours per day is spent in the classroom. The remainder of each day is spent in clinical sites at Duke University and the Durham VA Medical Center.

Prerequisites for Admission. Applicants must have a high school diploma. Applicants who had a science-oriented high school curriculum and/or some college experience will receive priority.

Application Procedures. Applications must be received by 1 June of the year for which admission is requested and must contain the following:

1. a completed application form;
2. results of the Scholastic Aptitude Test from the College Entrance Examination Board (CEEB);
3. official high school and/or college transcripts;
4. at least three letters of recommendation from individuals not related to the applicant—one from an individual acquainted with the applicant's character and the others from those acquainted with the applicant's educational or professional experience.

All applicants are notified by 15 July regarding admission to the program. Requests for further information and application forms should be directed to the Program Director, EEG Laboratory, P.O. Box 3948, Duke University Medical Center, Durham, NC 27710.

Registration Fees and Expenses. A fee of \$950 is required of all students enrolled in the program. An additional nonrefundable fee of \$30 for processing the application, payable to Duke University Medical Center, must accompany the application. Students do not pay full Duke tuition. Students must furnish their own uniforms. In addition, books cost approximately \$75.

Financial Aid. Please refer to the section on student aid in the chapter, "General Information."

Hospital and Clinical Pharmacy Residency

Director of Pharmacy Services: Milton W. Skolaut, B.S.

Associate Director of Pharmacy Services: James C. McAllister, M.S.

Assistant Director for Clinical Services: Christine Rudd, Pharm.D.

Residency Program. The Hospital and Clinical Pharmacy Residency is a twelve-month postbaccalaureate program conducted by the Department of Pharmacy at the Duke University Medical Center. The residency is designed to give the graduate pharmacist extensive training in clinical pharmacy practice and basic hospital pharmacy services including unit-dose drug distribution, large and small parenteral admixture service, total parenteral nutrition program, controlled drug systems, and hospital pharmacy administration.

Admission Standards. Applicants must be graduates of accredited schools of pharmacy and must have a B.S., M.S., or Pharm.D. degree. Resident candidates must have demonstrated good academic and leadership capabilities and be eligible for licensure in North Carolina. It is preferable that the applicant have previous hospital pharmacy experience.

Application Procedures. Applications must be submitted by 15 January of the year for which admission is requested and include the following:



1. ASHP resident matching program registration by the preceding 15 December;
2. personal interview, to be arranged by appointment;
3. official transcript from pharmacy school and other professional programs attended;
4. completed Allied Health Division application forms; and
5. letters of recommendation from at least three persons who have known the applicant professionally (i.e., pharmacy school professor, hospital pharmacist, clinical pharmacist).

Applicants will be notified by 30 March regarding admission to the program.

Stipend. A stipend of \$14,025 is granted for the twelve-month residency.

Travel Allowance. A travel allowance of \$350 is granted for the twelve-month residency.

Medical Technology

Chairman, Department of Pathology: Robert B. Jennings, M.D., *Professor of Pathology*

Director of Hospital Laboratories: Kenneth A. Schneider, M.D., *Professor of Pathology*

Medical Director, Medical Technology Program: Frances K. Widmann, M.D., *Associate Professor of Pathology*

Program Director, Medical Technology Program: Margaret C. Schmidt, MT(ASCP), SH, CLS(NCA), M.A., *Associate in Pathology*

Assistant Program Director, Medical Technology, Program: Cynthia L. Wells, MT(ASCP), CLS(NCA), M.Ed.

Education Coordinators, Medical Technology Program: Kenni B. Beam, MT(ASCP), SM, CLS(NCA), M.S.; Michael L. Bishop, MT(ASCP), CLS(NCA), M.S.; Iris W. Long, MT(ASCP), SH, CLS(NCA), B.S.

Professor: John A. Koepke, M.D.

Associate Professors: Dolph Klein, Ph.D.; Peter Zwadyk, Ph.D.

Assistant Professors: William H. Briner, B.S.; Jane T. Gaede, M.D.; Robert L. Habig, Ph.D.; Emily Reisner, Ph.D.; Frank Sedor, Ph.D.; John Toffaletti, Ph.D.

Associates: John A. Bittikofer, Ph.D.; Philip A. McHale, Ph.D.

Instructors: Enrique Estevez, Ph.D.; Ardell M. Proctor, MT(ASCP)M.S.; Robert F. Wildermann, C(ASCP)M.S.; Lizzie Harrell, Ph.D.

Clinical Teaching Staff: Billy, H. Abrams, MT(ASCP)B.A.; Judith P. Adams, MT(ASCP)B.S.; Marilyn Alexieff, MT(ASCP)B.A.; Barbara Benton, M.T.; Deborah Coombs-Jones, MT(ASCP)B.S.; Betty R. Crews, MT(ASCP)B.S.; Jean T. Crute, MT(ASCP)B.S.; Kathy De Biase, MT(ASCP)B.S.; Mary Ann Dotson, MT(ASCP)B.S.; June Gregonis, MT(ASCP)B.S.; Samuel E. Hargraves, NRCC, B.S.; Cathy Holleman, MT(ASCP)SC, M.S.; Kathryn Kirvan, MT(ASCP)B.S.; Freda Kohan, MT(ASCP), SM, B.S.; Elizabeth Lloyd, MT(ASCP) SH, B.S.; Ellen Lundberg, MT(ASCP)B.S.; Ruth Parrish, M.T.; Denise Rodio, MT(ASCP)SBB, B.S.; Suzanne Schrack, MT(ASCP)B.S.; Daryl Shank, SM(ASCP)M.S.; Charles E. Stewart, MT(ASCP)B.H.S.; Patricia E. Thurrell, MT(ASCP)SBB, M.Ed.; Shirley Violand, MT(ASCP)SI, M.S.; Irene A. Wyatt, MT(ASCP)B.S.

Affiliate Institution Advisers: Robert K. Reid, Ph.D., *Meredith College*; Marsha E. Fanning, Ph.D., *Lenoir-Rhyne College*; George F. Jackson, Ph.D., *University of Tampa*

Program of Study. The educational program begins 1 June and consists of fifty-six instructional weeks plus three weeks of vacation. The first twelve weeks consist of a core curriculum of clinical pathology courses offered to all students at the same time. After successful completion of the core curriculum, the student is eligible to begin forty weeks of clinical rotations in the Medical Center laboratories. In the spring, a four-week term is devoted to a course of study in educational techniques, management and supervision, computers in laboratory medicine, and other clinical laboratory sciences. Lectures, student laboratory experience, and clinical laboratory instruction are presented by a faculty and staff of physicians chemists, microbiologists, and medical technologists.

Graduates of this CAHEA-approved program are eligible for national certification as a medical technologist. Career opportunities in hospital laboratories, research, public health facilities, and educational institutions are widely available. This pro-

gram is formally affiliated with Meredith College, Raleigh, North Carolina; Lenoir-Rhyne College, Hickory, North Carolina; and the University of Tampa, Tampa, Florida, to provide the 3 + 1 study format toward a degree from these institutions.

Prerequisites for Admission. Applicants to the program must possess the following academic prerequisites:

1. Possession of a baccalaureate degree, OR the completion of at least three years of study in an accredited college or university which totals ninety semester hours (120 quarter hours) with grades of C or better, and the written guarantee that a baccalaureate degree will be conferred by a university after successful completion of this program.
2. Sixteen semester hours (twenty-four quarter hours) of chemistry (including at least one course in organic chemistry). Quantitative analysis may be accepted in lieu of the second semester of organic chemistry.
3. Sixteen semester hours (twenty-four quarter hours) of biology (including one course in microbiology).
4. One course of college level mathematics.

Application Procedures. Applications should be submitted by 1 April of the year for which admission is requested and must contain the following:

1. The completed Duke University Medical Center Allied Health application form, including a nonrefundable processing fee;
2. Official transcript(s) from all colleges and universities attended;
3. Three letters of recommendation, one from a professor of biological sciences, one from a professor of chemistry, and one from a college adviser;
4. A personal interview with members of the Admissions Committee, if requested, following the receipt of the application and other information;
5. A written statement of interest in medical technology;
6. A NAACLS transcript evaluation, if requested.

Applicants will be notified no later than 1 May regarding admission to the program. Requests for further information and application forms should be directed to the Medical Technology Program, Box 2929, Department of Hospital Laboratories, Duke University Medical Center, Durham, North Carolina 27710.

Fees and Expenses. Tuition for the program is \$2,200.* A minimal lab fee is charged for the core curriculum. The student is responsible for housing, board, uniforms, books, and health fee and insurance.

A nonrefundable deposit of \$175 is required of all accepted candidates to hold their place in the class. This deposit applies toward the tuition fee. The remaining tuition and fee balance is billed in two increments; at matriculation and in January (mid-year).

Transportation Required The use of facilities other than Duke and Durham Veterans Administration Medical Centers requires transportation. It is the responsibility of each medical technology student to provide a means of transportation to and from the facilities selected for learning experiences. Although a few sites may be within bicycling distance, most are not.

Financial Aid. Please refer to the section on student aid in the chapter, "General Information." All candidates are urged to seek independent sources of financial assistance.

Courses of Instruction. Students must complete the following courses:

*Subject to change without prior notice.

Core Curriculum*

<i>Course Title</i>		<i>Lect/Lab Clock Hours</i>
MT 107	Human Pathology	27/00
MT 112A	Medical Chemistry/Instrumentation	40/40
MT 120	Immunohematology	42/24
MT 121A	Blood and Body Fluids	36/54
MT 123	Principles of Immunology	18/00
MT 132	Medical Microbiology/Serology	37/34

*Course work in the core curriculum must be successfully completed to gain access to clinical rotation courses which follow.

Clinical Rotations and Courses

<i>Course Title</i>		<i>Lecture Clock Hours</i>	<i>Total Rot. Weeks</i>
MT 151	Clinical Microbiology/Serology	—	10
MT 153	Clinical Immunology-Immunohematology	—	10
MT 155	Clinical Blood and Body Fluids	—	10
MT 157	Clinical Chemistry	—	10
MT 113	Quality Assurance and Statistics	12	—
MT 114	Clinical Laboratory Correlations	26	—
MT 112B	Medical Chemistry/Instrumentation	30	—
MT 121B	Blood and Body Fluids	30	—

<i>Spring Term</i>		<i>Lect/Lab Clock Hours</i>
MT 122	Parasitology	12/24
MT 124	Educational Techniques for the Health Professional	20/00
MT 126	Laboratory Supervision and Management	24/00
MT 110	Medical Applications of Computers	12/00

Pastoral Care and Counseling

Associate in Instruction: Peter G. Keese, S.T.B., Th.M., *Director of Clinical Pastoral Education Programs*

Associates in Instruction: P. Wesley Aitken, B.D., Th.M.; John C. Detwiler, B.D., Th.M.; David M. Franzen, B.D.

Professor: Richard A. Goodling, B.D., Ph.D.

Associate Professor: Paul A. Mickey, B.D., Ph.D.

A graduate program in pastoral care and counseling is available to clergy and sympathetic laity of all religious groups. There are four program options: a single unit of clinical pastoral education, an internship, a residency, and a fellowship. All are designed to train ordained individuals who desire to specialize in pastoral care and counseling, enhance their skills as parish clergy, or to broaden their understanding. Those who enroll in the program will be required to serve as chaplains or as pastoral counselors in the Medical Center or in the community of Durham. All program options are approved by the Association for Clinical Pastoral Education, Inc.

Programs of Study. The following programs in basic, advanced, and supervisory clinical pastoral education are offered at the Duke University Medical Center:

Single Unit of Basic CPE—The single unit is offered during the summer months, beginning in June and lasting ten to twelve weeks (dates to be specified). It is also offered on a part-time basis concurrently with the fall and spring semesters of Duke Divinity School (the fall/spring extended quarter). Admission to the single unit of basic CPE is based on the following:

1. submission of written application materials;
2. admission interview by a qualified examiner;

3. acceptance by the center.

*Clinical Internship (Basic CPE)**—The internship usually begins in June and lasts for twelve months (dates to be specified). This program grants four units of CPE credit with the ACPE. Admission is based on the following:

1. graduation from college—equivalencies may be considered;
2. evidence of serious religious and theological interest;
3. completion and supervisor's evaluation of one certified unit of CPE (basic unit) in an accredited center usually strengthens the application;
4. submission of written application materials;
5. a personal interview with the supervisory and teaching staff;
6. acceptance by the center.

*Clinical Residency (Advanced CPE)**—The residency usually begins in September and lasts twelve months. The specialization of the advanced year may be in a number of clinical settings including pastoral counseling and hospital chaplaincy. Four units of CPE credit are granted with the ACPE. Admission is based on the following:

1. evidence of successful completion of the program objectives of basic CPE, or its equivalent. Usually this means a minimum of two units of basic CPE;
2. submission of written application materials;
3. a personal interview with the supervisory and teaching staff;
4. acceptance by the center.

*A Fellowship in Supervisory CPE**—Supervisory CPE provides a learning opportunity for the qualified person, with demonstrated personal, professional, and clinical competence who desires to become a certified supervisor of CPE. Admission to this program is based on his/her potential to assist others in the clinical methods of learning, together with a capacity to acquire techniques and theories of supervision. Admission to supervisory CPE is based on:

1. ecclesiastical endorsement;
2. a period of time which allows the candidate to demonstrate his/her ability to function pastorally, usually not less than three years;
3. completion of program objectives of basic and advanced CPE, usually at least four units of CPE;
4. consultation by the appropriate committee in the region with respect to his/her readiness to pursue supervisory training;
5. submission of written application materials;
6. a personal interview with the supervisory and teaching staff;
7. acceptance by the center.

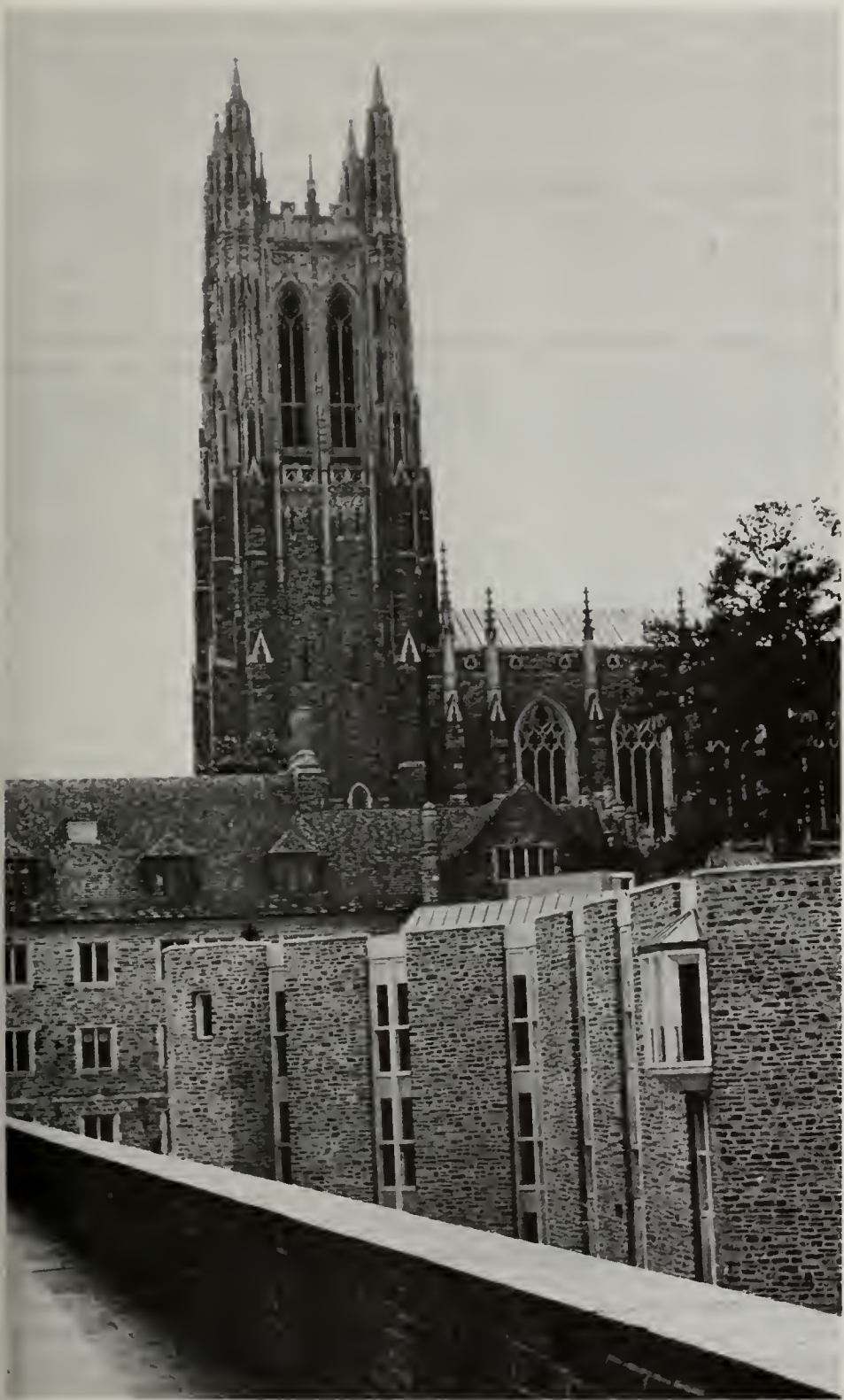
Beginning and ending dates vary according to the needs of the trainee and the program.

Requests for application and further information about any of the programs should be directed to the Director, Pastoral Care and Counseling Programs, Box 3112, Duke University Medical Center, Durham, North Carolina 27710.

Registration Fees and Expenses. A fee is usually charged for the screening (admission) interview. In our region of the ACPE, Mid-Atlantic, the fee is \$35. The fee varies from place to place throughout the nation. All students who take clinical pastoral education at Duke Medical Center must be accepted and enrolled through either the Division of Allied Health or Duke Divinity School.

Students who wish to receive academic credit shown on a transcript should apply for admission to Duke Divinity School as a degree candidate (M. Div. or Th.M.) or as

*Students who are taking more than two courses (not including CPE) in the Divinity School for academic credit will receive only three certified units of CPE—one in the summer, one in the fall, and one in the spring. All others receive four units of certified CPE. Beginning and ending dates vary according to the needs of the trainee and the program.



a special student. They will then enroll for CPE through Duke Divinity School and will pay fees to the Divinity School according to Divinity School charges. Residents in pastoral counseling are required to be enrolled through the Divinity School.

All other students must be enrolled through the Division of Allied Health, Duke Medical Center, whether for single units or year-long programs. For 1983-84 fees are \$225 per unit.

Financial Aid. A limited number of training stipends are available for the internship, residency, and fellowship. No stipends are available for the single unit of training.

Physician Assistant

A limited number of students who are not eligible for admission to the Bachelor of Health Science degree program, but who possess outstanding credentials in a health care field, are accepted into the certificate program. The two-year program, including tuition, is the same as that described previously. Students are issued a Duke University undergraduate identification card and are granted the same privileges as the physician assistant students in the Bachelor of Health Science degree program. Prerequisites for admission differ in that applicants not planning to receive the degree need not complete sixty semester hours of college level courses. Also, these applicants must submit their high school transcript(s); transcripts from diploma nursing or other health professional schools and military training programs; must complete by 15 January a college level course in both general chemistry and general biology; and must complete, also by 15 January, two years of health care experience.

Prosthetic/Orthotic Technology

Professor and Medical Adviser: Frank W. Clippinger, M.D.

Professor: Frank H. Bassett III, M.D.

Course Director and Assistant Professor: David W. Vaughn, C.P.O.

Clinical Adviser and Coordinator: Patricia R. Hazard, C.O.

Instructors: C. Ross Tinger, C.P.; Percy H. Ray, C.O.; Felton L. Elliott, C.O.; William E. Harris, C.O.

Clinical Assistant Instructors: Dan Ellis, R.T.P.; Carson Perry, R.T.O.; Louis Whitfield, R.T.O.

Prosthetic/Orthotic Technology Certificate Program. Students are admitted each September for a two-year Orthotic or Prosthetic Technology Certificate Program. Each student receives both academic and clinical training in all aspects of the field. After successful completion of the program, the student is eligible to take the National Technician Registry Examination administered by the American Board for Certification in Orthotics and Prosthetics, Inc.

Program of Study. The program follows the guidelines established by the American Board for Certification in Prosthetics and Orthotics, Inc., under clinical affiliation and training. The number of hours devoted to all subjects generally exceeds their basic minimal requirements. Class lectures are scheduled weekly during the year. The remainder of the program involves a series of clinical and technical rotations in all aspects of technological activity under the supervision of full-time certified or registered orthotic/prosthetic practitioners and/or technicians, senior staff orthopaedic surgeons, and orthopaedic residents. Periodic examinations are given to evaluate progress, with the seventy-fifth percentile constituting a passing grade.

Full time attendance is mandatory in both classroom and practical work, maximum unscheduled hours of absence for the calendar year is forty (40). Beginning second semester, periodic rotations on Saturday, Sunday, and selected week nights may be required.

Prerequisites for Admission. All applicants must have a diploma from an accredited high school or its equivalent.

Application Procedures. The following are necessary to complete the application procedures:

1. A completed application form including a recent photograph and a nonrefundable fee of \$30;
2. Official transcripts from all high schools, colleges or professional schools attended;
3. Three letters of recommendation from persons not related to the applicant;
4. A personal interview.

Request for further information and application forms should be directed to the Course Director, Orthotic/Prosthetic Technology Program, Box 3885, Duke University Medical Center, Durham, North Carolina 27710.

Expenses. A course fee of \$500 per year is charged. In addition, books and supplies will cost approximately \$250 per year.

Financial Aid. The program is approved for the enrollment of persons eligible for benefits under Title 38 USC(G.I. Bill). Please refer to the section on student aid in the chapter, "General Information." A limited stipend is available for second-year students.

Specialist in Blood Bank Technology

Chairman, Department of Pathology: Robert B. Jennings, M.D., *Professor of Pathology*

Director of Hospital Laboratories: Kenneth A. Schneider, M.D., *Professor of Pathology*

Medical Directors, Specialist in Blood Bank Program: John A. Koepke, M.D., *Professor of Pathology*;

Marcus B. Simpson, M.D., *Assistant Professor of Pathology*

Program Director and Education Coordinator, Specialist in Blood Bank Program: Tricia Thurrell, M.Ed., MT(ASCP) SBB

Program Instructors: Tabbie Bolk, MT(ASCP) SBB; Denise Y. Rodio, MT(ASCP) SBB; Gail Vesilind, MT(ASCP) SBB

Professor: Wendell K. Rosse, M.D.

Associate Professor: Francis K. Widmann, M.D.

Assistant Professor: Emily G. Reisner, Ph.D.

Instructors: Margaret C. Schmidt, MT(ASCP) SH, M.A.T.; Cynthia L. Wells, M.Ed., MT(ASCP);

Robert F. Wildermann, M.S., C(ASCP)

Triangle Center Red Cross Instructors: Donald Bennett, MT(ASCP); Ann Califf, MT(ASCP) SBB;

Kathy DeBiase, MT(ASCP) SBB

In January 1982, the Transfusion Service in the Department of Hospital Laboratories of the Duke University Medical Center began a twelve-month program in advanced blood bank technology. This program is accredited by the American Association of Blood Banks and the American Medical Association's Committee on Allied Health Education and Accreditation (CAHEA). It is designed to give experience in administration, supervision, teaching, technical consultation, and research. Upon satisfactory completion of the course work, the student is awarded a certificate and is eligible for national certification as a Specialist in Blood Bank Technology. Career opportunities in hospital blood banks and transfusion services, independent blood centers, research and development laboratories, sales and marketing positions, and educational institutions are widely available.

Program of Study. The educational program begins on the last Monday of January and consists of approximately fifty-four instructional weeks including two weeks of vacation. The first week is an orientation period which leads into the clinical rotations at the Medical Center and at the Triangle Center Red Cross. Each Wednesday is devoted to didactic coursework, discussion groups, and counseling sessions. By utilizing one day a week in this manner, minimum disruption occurs in the clinical rotations. Instruction is provided by the faculty and staff of the Medical Center.

Prerequisites for Admission. Applicants to this program shall possess a baccalaureate degree which includes sixteen (16) semester hours (or the equivalent) of biology; sixteen (16) semester hours (or the equivalent) of chemistry, including one semester of organic chemistry; and one course in college mathematics or computer science. The equivalent of two years of full-time work experience is required before matriculation into the program. It is desirable that some of the work experience be in hospital blood banking. If the applicant is certified by a recognized certification agency as a medical technologist, the work experience required may be shortened by the length of time spent in the clinical rotations in the structured educational program. The directors of the program will rule on the acceptability of the work experience.

Application Procedures. Applications should be submitted by 1 August, and must contain the following:

1. A completed Duke University Medical Center Allied Health application form, including a nonrefundable processing fee;
2. Two copies of the American Association of Blood Banks Educational Program for Specialist in Blood Bank Technology application form;
3. A notarized copy of the certificate from the certifying agency OR official transcripts from all colleges and universities attended;
4. Three letters of recommendation, one from a college professor in the natural sciences, one from a present employer (or immediate past employer if not currently working), and one from the education coordinator of the laboratory education program or a laboratory supervisor or a college adviser;
5. A handwritten statement of interest in further education in blood banking and this program (not to exceed 500 words);
6. A personal interview with members of the Admissions Committee following the receipt of the application forms and other requested information.

Applicants will be notified no later than 1 November regarding admission to the program. Requests for information and application forms should be directed to the Education Coordinator, Specialist in Blood Bank Program, Box 2928, Duke University Medical Center, Durham, North Carolina 27710.

Fees and Expenses. Tuition for the program is \$2,000, payable in two installments, at matriculation and in September. Each SSB student is considered a part-time employee of the Transfusion Service and can expect to earn approximately \$8,000 during the year. This could be supplemented by additional weekend work if so desired. The student is responsible for housing, board, books, student health fee, and insurance.

Financial Aid. Please refer to the section on student aid in the chapter "General Information."

Courses of Instruction. Students must complete the following courses and clinical rotations:

<i>Course Title</i>		<i>Contact Hours</i>
SSB 101A	Immunology	12
SSB 101B	Genetics	12
SSB 102A	Coagulation, Component Therapy	16
SSB 102B	Hematology	32
SSB 103	Human Blood Groups	48
SSB 104	Special Topics in Blood Banking	16
SSB 105	Quality Assurance	8
SSB 106	Educational Techniques	26
SSB 107	Management/Supervision	15
SSB 108	Seminars in Transfusion Medicine	50
SSB 109	Blood Procurement/Component Preparation	8

<i>Clinical Rotations</i>		<i>Weeks</i>
SSB 110	Transfusion Service/Compatibility Laboratory	16
SSB 111	AABB Certified Immunohematology Reference Laboratory	16
SSB 112	Coagulation	2
SSB 113	HLA Laboratory	2
SSB 114	Triangle Center Red Cross	10
SSB 115	Research	4

Speech Pathology—Audiology Residency

Professor: LuVern H. Kunze, Ph.D., *Director, Center for Speech and Hearing Disorders*
 Associate Professor: Bruce A. Weber, Ph.D.
 Assistant Professors: Jennifer Horner, Ph.D. and John Riski, Ph.D.
 Associate: Burton B. King, M.A.
 Clinical Staff: Glen M. Baquet, M.A.; Sharon Didow, M.S.; Janice Mack, M.Ed.; Susan McNair, M.Ed.; Phyllis A. Morage, M.S.; Karen R. Nailling, M.S.; and Barbara G. Saunders, M.A.

Residency Program. The Speech Pathology-Audiology Residency is a twelve-month postmasters program conducted by the Center for Speech and Hearing Disorders, Department of Surgery, Duke University Medical Center with cooperative participation of the Audiology and Speech Pathology Service, Veterans Administration Medical Center and the Developmental Evaluation Clinic, Department of Pediatrics, Duke University Medical Center. The residency is patterned after the residency programs in medicine and is designed to give the practicing speech pathologist advanced clinical training in three selected areas of specialization, including childhood language disorders; communicative disabilities secondary to neurogenic disorders; and organic disorders of speech including cleft palate, craniofacial anomalies, laryngeal pathology, laryngectomy, and respiratory disorders. Audiologists may receive advanced clinical training in a medical setting with emphasis in brainstem reponse audiometry. Competency in clinical practice and concomitant theoretical study are emphasized.

Admission Standards. A resident must have earned a masters or doctoral degree in speech/language pathology and/or audiology from an accredited institution of higher learning. Though a Certificate of Clinical Competence from the American Speech and Hearing Association is not required, the applicant must hold or be qualified for a license to practice in North Carolina.

Application Procedures. Residents are admitted 1 January and 1 July. Applications for admission to the residency must be received four months prior to the date of admission. Applications will include:

1. completed Allied Health Division and Center for Speech and Hearing Disorders forms;
2. official transcript from the institution granting the terminal degree;
3. personal interview to be arranged by appointment; and
4. letters of recommendation from at least three persons able to evaluate the applicant's professional strengths and weaknesses.

Applicants will be notified regarding admission no later than seventy-five days prior to the date of admission.

Stipend. A stipend is available for the twelve-month residency.

LEGEND

- | | |
|-----------------------------------|--|
| 1 - ORIGINAL HOSPITAL | 16 - RESEARCH PARK BLDG. NO. 2 |
| 2 - DAVISON BUILDING | 17 - RESEARCH PARK BLDG. NO. 4 |
| 3 - BAKER HOUSE | 18 - RESEARCH PARK BLDG. NO. 1 |
| 4 - RESEARCH PARK BLDG. NO. 3 | 19 - RESEARCH PARK BLDG. NO. 5 |
| 5 - BRYN MAWR BLDG. | 20 - NURSING SCHOOL ADDITION |
| 6 - CLINICAL RESEARCH NO. 1 | 21 - HANES HOUSE |
| 7 - CLINICAL RESEARCH NO. 2 | 22 - GRADUATE CENTER |
| 8 - RESEARCH PARK BLDG. NO. 1 | 23 - RESEARCH PARK BLDG. NO. 3 |
| 9 - HEATING PLANT | 24 - HANES ANNEX |
| 10 - MAINTENANCE AND GARAGE | 25 - RETARDATION CLINIC |
| 11 - BELL BLDG. | 26 - SMOKE BLDG. MEDICAL SCIENCE 1-B |
| 12 - BELL BLDG. | 27 - SMOKE BLDG. MEDICAL SCIENCE 1-C |
| 13 - MINAINE M. DUKE BLDG. | 28 - PARKING GARAGE |
| 14 - CENTRAL ANIMAL CARP FACILITY | 29 - LIBRARY |
| 15 - RESEARCH PARK BLDG. NO. 3 | 30 - CHILD GUIDANCE CLINIC |
| | 31 - RESEARCH PARK BLDG. NO. 2 |
| | 32 - CLINICAL CANCER RESEARCH C.R. NO. 3 |
| | 33 - ANIMAL LABORATORY AND ISOLATION FACILITY (ALIF) |
| | 34 - HOSPITAL NORTH |
| | 35 - PARKING GARAGE NO. 2 (PROPOSED) |
| | 36 - YEARLY ST. PARKING LOT EXPANSION |



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bulletin of

Duke University 1983-84

Medical Center



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Duke University 1983-84

Medical Center

EDITOR
Judy A. Beck
SENIOR EDITORIAL ASSISTANT
Elizabeth Matheson
BULLETIN COORDINATOR
Nell F. Andrews, Medical Center

PHOTOGRAPHS
Beth Parsons
Thad Sparks

COVER DESIGN
Donna S. Slade

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The information in the bulletin applies to the academic year 1983-84 and is accurate and current, to the best of our knowledge, as of February, 1983. The University reserves the right to change programs of study, academic requirements, lecturers, teaching staffs, the announced University calendar, and other matters described in the bulletin without prior notice, in accordance with established procedures.

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School of Medicine Calendar 1983–84

First Year (Freshmen) Students

1983

August	
19	Friday, 8:30 A.M.—Orientation
22	Monday, 8:00 A.M.—First day of academic year, 1983–84, begin fall term
September	
5	Monday—Labor Day holiday
November	
23	Wednesday, 6:00 P.M.—Begin Thanksgiving holiday
28	Monday, 8:00 A.M.—Classes resume
December	
20	Tuesday, 6:00 P.M.—End fall term

1984

January	
9	Monday, 8:00 A.M.—Begin spring term
March	
2	Friday, 6:00 P.M.—Begin spring vacation
12	Monday, 8:00 A.M.—Classes resume
May	
4	Friday, 6:00 P.M.—End spring term
7	Monday, 8:00 A.M.—Begin introduction to clinical sciences (summer term)
June	
23	Saturday, 12:00 noon—End introduction to clinical sciences (summer term)

Second Year (Sophomore) Students

Summer Term 1983

May	
2	Monday, 8:00 A.M.—Begin classes in section 81
June	
25	Saturday, 6:00 P.M.—End classes in section 81
27	Monday, 8:00 A.M.—Begin classes in section 82
July	
4	Monday—Independence Day holiday
August	
20	Saturday, 12:00 noon—End classes in section 82

Fall Term 1983

August	
29	Monday, 8:00 A.M.—Begin classes in section 81
September	
5	Monday—Labor Day holiday
October	
22	Saturday, 12:00 noon—End classes in section 81
24	Monday, 8:00 A.M.—Begin classes in section 82
November	
23	Wednesday, 6:00 P.M.—Begin Thanksgiving holiday
28	Monday, 8:00 A.M.—Classes resume
December	
17	Saturday, 12:00 noon—End classes in section 82

Spring Term 1984

January	
2	Monday, 8:00 A.M.—Begin classes in section 81
February	
25	Saturday, 12:00 noon—End classes in section 81
27	Monday, 8:00 A.M.—Begin classes in section 82

March	
13-14	Tuesday-Wednesday—Registration for summer term, 1984
April	
17-18	Tuesday-Wednesday—Registration for fall term elective courses, 1984
21	Saturday, 12:00 noon—End classes in section 82

Summer Term 1984

April	
30	Monday, 8:00 A.M.—Begin classes in section 81
June	
23	Saturday, 12:00 noon—End classes in section 81
25	Monday, 8:00 A.M.—Begin classes in section 82
July	
4	Wednesday—Independence Day holiday
August	
18	Saturday, 12:00 noon—End classes in section 82

Third Year (Junior) and Fourth Year (Senior) Students

Summer Term 1983

May	
9	Monday, 8:00 A.M.—Begin classes in sections 16, 81, 41
June	
4	Saturday, 12:00 noon—End classes in section 41
6	Monday, 8:00 A.M.—Begin classes in section 42
July	
1	Friday, 6:00 P.M.—End classes in sections 81, 42
4	Monday—Independence Day holiday
5	Tuesday, 8:00 A.M.—Begin classes in sections 82, 43
30	Saturday, 12:00 noon—End classes in section 43
August	
1	Monday, 8:00 A.M.—Begin classes in section 44
27	Saturday, 12:00 noon—End classes in sections 16, 82, 44

Fall Term 1983

August	
29	Monday, 8:00 A.M.—Begin classes in sections 16, 81, 41
September	
5	Monday—Labor Day holiday
24	Saturday, 12:00 noon—End classes in section 41
26	Monday, 8:00 A.M.—Begin classes in section 42
October	
22	Saturday, 12:00 noon—End classes in sections 81, 42
24	Monday, 8:00 A.M.—Begin classes in sections 82, 43
November	
1-2	Tuesday-Wednesday—Registration for spring term, 1984
19	Saturday, 12:00 noon—End classes in section 43
21	Monday, 8:00 A.M.—Begin classes in section 44
23	Wednesday, 6:00 P.M.—Begin Thanksgiving holiday
28	Monday, 8:00 A.M.—Classes resume
December	
17	Saturday, 12:00 noon—End classes in sections 16, 82, 44

Spring Term 1984

January	
9	Monday, 8:00 A.M.—Begin classes in sections 16, 81, 41
February	
4	Saturday, 12:00 noon—End classes in section 41
6	Monday, 8:00 A.M.—Begin classes in section 42
March	
3	Saturday, 12:00 noon—End classes in sections 81, 42. Begin spring vacation
12	Monday, 8:00 A.M.—Classes resume. Begin classes in sections 82, 43

13-14	Tuesday-Wednesday—Registration for summer term, 1984
April	
7	Saturday, 12:00 noon—End classes in section 43
9	Monday, 8:00 A.M.—Begin classes in section 44
17-18	Tuesday-Wednesday—Registration for fall term, 1984
May	
5	Saturday, 12:00 noon—End classes in sections 16, 82, 44
5-6	Saturday-Sunday—Graduation activities



University Administration

General Administration

Terry Sanford, J.D., LL.D., D.H., L.H.D., D.P.A. *President*
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Medical Center Administration

Office of Vice-President for Health Affairs

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Larry D. Nelson, *Director of Planning*
Louis E. Swanson, M.H.A., *Director of Program Planning*
L. T. Matthews, B.A., *Director of Engineering and Operations*

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Suydam Osterhout, M.D., Ph.D., *Associate Dean, Admissions*
Harry A. Gallis, M.D., *Director, Continuing Medical Education and Area Health Education*
John L. Weinerth, M.D., *Director, Graduate Medical Education*
Shirley K. Osterhout, M.D., *Assistant Dean for Student Affairs*
Charles B. Johnson, Ed.D., *Associate University Registrar and Registrar, Medical Center*

Office of Duke University Hospitals

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Roger Akers, B.S., *Controller, Duke Hospital*
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Michael J. Schwartz, M.H.A., *Associate Director, North Division*
V. Gregg Watters, M.H.A., *Associate Director, South Division*
Wilma Minniear, R.N., M.S.M., *Executive Director, Nursing Service*
Delford L. Stickel, M.D., *Associate Director, Medical Affairs*
John Weinerth, M.D. *Associate Director, House Staff Affairs*

Office of the School of Nursing

Ruby L. Wilson, R.N., Ed.D., *Dean*
Eleanor C. Bradsher, *Administrative Assistant to the Dean*
Edward E. Cooke, B.A., *Staff Assistant to the Dean*
Dorothy J. Brundage, R.N., Ph.D., *Associate Dean*
Carla Peterson, *Staff Assistant for Academic Affairs*
Donna Hewitt, R.N., M.S.N., *Coordinator for Continuing Education Programs*
Ella E. Shore, M.R.E., M.A., *Dean of Student Affairs*



Standing Committees of the School of Medicine and Medical Center

Admissions—Allied Health Degree

A. C. Christakos, M.D., *Chairman*; Drs. Hamilton, C. Johnson, Neelon, and Widmann

Admissions—Allied Health Certificate

A. C. Christakos, M.D., *Chairman*; Drs. C. Johnson, Logue, Moylan, and Rice

Admissions—Medical School

Suydam Osterhout, M.D., Ph.D., *Chairman*; Drs. Akwari, N. C. Anderson, W. B. Anderson, R. Coleman, Filston, Gianturco, Kamin, Kay, Kredich, Oldham, Parkerson, Rajagopalan, Rourk, Steege, Vogel, Warburton, Ward, and Worde; Ms. King, *Administrative Assistant*; student representatives, Ms. Gellman and Jackson; Mr. Mallon

Anatomical Gifts

Delford Stickel, M.D., *Chairman*; Drs. Adams, Foulks, Harrelson, and Weinerth; Ms. Loftin and Padilla; Messrs. Peterson and Stinson

Animal Care Advisory

J. C. Rodio, *Chairman*; Drs. Bigner, Bresnahan, Cant, Currie, Dennis, Erickson, Lynn, Mendell, Nielson, Oldham, Slotkin, Tyrey, and Wolbarsht

Audit and Tissue

Clinical Chairman of each clinical service and head of each division in service

Awards Committee for Student Awards

Shirley Osterhout, M.D., *Chairman*; departmental professional advisers from basic and clinical departments, Davison Society President

Brain Death

William P. Wilson, M.D., *Chairman*; Drs. Cooke, Erwin, Friedman, Green, Hurowitz, Kramer, Lewis, Luther, Olanow, Roses, Sanders, and Wilkins

Clinical Cancer Education Program

W. W. Shingleton, M.D., *Chairman and Director*; Drs. Faletta, Grufferman, McGrath, and Michalopoulos; Ms. Farrell

Clinical Investigations

Jerome S. Harris, M.D., *Chairman*; Ms. Barbara Echols, *Cochairman*; Drs. Back, Bradford, Contanch, Foulks, Fox, Gall, Gallegher, Lakin, Mahorney, Semans, and Workman; Chaplain Aitken; Ms. Diosegy, Patterson, and Perry; Messrs. Nelson and Stargel; *Alternates*: Drs. Alexander, Bartol, Campbell, Fagraeus, Falletta, Farmer, Killam, Kylstra, Reimer, Shields, Taska, and Wilkinson; Chaplain Keese; Ms. Wilkins; Messrs. Gholson and Drew; *Student Representatives*: Messrs. Komrad and Kylstra

Continuing Education

Harry A. Gallis, M.D., *Chairman*; Drs. Christakos, Bradford, Kirks, Moylan, Munning, Parkerson, Rourk, and Walker

Curriculum Committees

First Year: Robert Bell, M.D., *Chairman*; Drs. Borowitz, Cant, Caron, Hylander, Kuhn, Machemer, Michalopoulos, Ottolenghi, Padilla, Scott, Ralph Smith, Robert Thompson, and Webster; *Student Representatives*: Messrs. Crone, Howard, and Howell

Second Year: Frederick Hine, M.D., *Chairman*; Drs. Armstrong, Bollinger, Burch, Dunnick, Ford, Fortier, Grandis, R. Gutman, Haynes, Parkerson, Rankin, Stead, Volow, William Wilkinson, and Worley; *Student Representative*: Ms. Kleiner

Third Year: Robert Wheat, M.D., *Chairman*; Drs. Blumenthal, Susan Brown, Corley, Cromer, Greenleaf, Keefe, MacPhee, Nadler, Pizzo, Reedy, Sage, Salzano, Simon, Whorton, and Woodard; *Student Representative*: Ms. Livingston

Fourth Year: James Bobula, M.D. *Chairman*; Drs. Block, Bowie, Chandler, Fuller, Steven Gross, Haygood, Herskovic, Leight, Livengood, Lowe, McCuen, Michener, Redick, Sampson, Stoudenmire, Stead, and Williams; *Student Representative*: Mr. Karas

Davison Scholarship

Shirley Osterhout, M.D., *Chairman*; Drs. Arthur C. Christakos and Frank Neelon

Duke Comprehensive Cancer Center Advisory

W. W. Shingleton, M.D., *Chairman*; Drs. Amos, Anlyan, Bolognesi, Christakos, Durak, Estes, Hammond, Hill, Hout, Jennings, Johnson, Joklik, Katz, Kirscher, Putman, Robertson, Sabiston, Wallace, and Wilson; Mr. Winfree

Emergency Department Advisory

Joseph A. Moylan, Jr., M.D., *Chairman*; Drs. English, Garrett, Livengood, Pauk, Ravin, and Sydnor; Ms. Ford, Falconer, Fleming, and Weber; Messrs. Goodfellow, Richards, Schwartz, and Wilderman

Financial Aid

Ms. Nell Andrews, *Coordinator*; Drs. Christakos, Johnston, and Suydam Osterhout; Ms. King; Mr. McGinty; student representatives, Ms. Holcomb; Messrs. Dietz and St. Peter

Hospital Advisory

Andrew G. Wallace, M.D., *Chairman*; Drs. Anlyan, Christakos, Durack, Estes, Hammond, Harmel, Houpt, Jennings, Katz, Machemer, Putman, and Sabiston; Ms. Ferguson and Minniear; Messrs. Aker, Berry, Donelan, Mau, and Yagey

Hospital Infections

Suydam Osterhout, M.D., Ph.D., *Chairman*; Drs. Bullard, Carson, Duffin, Durack, Gallis, Hamilton, Jackson, Klein, Livengood, Richards, Strohm, Thomann, and Wilfert; Ms. Falconer, Palmer, Piro, Robbins, Rudd, and Steele

Medical Center Radiation Control and Radioactive Drug Research Committee

Henry Kamin, Ph.D., *Chairman*; Drs. Briner, Harris, Sanders, Sullivan, Tyor, and Wolbarsht; Messrs. Knight and Schwartz

Medical Center Safety

Mr. Conrad Knight, *Chairman*; Drs. Bradford, Deubner, Elchlepp, Jackson, Suydam Osterhout, and Thomann; Messrs. Benbow, Bowman, Craig, Hopkins, Law, Riley, Rodio, and Shaver; Ms. Brady and Hendrix

Medical Education Policy Advisory

A. C. Christakos, M.D., *Chairman*; Drs. Bell, Bobula, Hine, C. Johnson, Shirley Osterhout, and Wheat; Ms. Lee; *Student Representatives*: Ms. Kleiner and Livingston; Messrs. Hooper, Howard, and Karas

Medical Records

George J. Ellis III, M.D., *Chairman*; Drs. Baber, Grufferman, Jelovsek, Serwer, Stickel, and Wang; Ms. Borden and Hale; Messrs. Hunt, Kulik, Perry, and Waters

Medical School Advisory

William G. Anlyan, M.D., *Chairman*; Drs. Christakos, Durack, Estes, Hammond, Harmel, Hill, Hought, Jennings, T. Johnson, Joklik, Katz, Kirshner, Machemer, Putman, Robertson, Sabiston, and Wallace; Mr. Bennett

North Carolina Residence

Suydam Osterhout, M.D., Ph.D., *Chairman*; Drs. Clapp, C. Johnson, and Peete

Operating Room Advisory

David Sabiston, M.D., *Chairman*; Drs. Creasman, Filston, Georgiade, Goldner, Hammond, Harmel, Lumb, Maroof, and Moylan; Ms. Farmer, Flemming, Owins, and Wicker; Messrs. Brandon, Cousino, Maynard, and Waters

Pharmacy and Therapeutics

James C. Fuchs, M.D., *Chairman*; Drs. Cobo, Heaston, Killam, Lipper, Murray, Shirley Osterhout, Perfect, Peter, Shand, and Tashjian; Ms. Bowers; Messrs. Fitzgerald and Skolaut; Chief Resident in the Department of Medicine

Research Award

F. Stephen Vogel, M.D., *Chairman*; Drs. Fridovich, Gallagher, Metzgar, Schanberg, Semans, and Spach

Study Away Committee

Arthur C. Christakos, M.D., *Chairman*; Drs. Shirley Osterhout, McCarty, Warburton, and Yarger

Utilization Review

William J. Murray, M.D., *Chairman*; Drs. Arena, Barwick, Buckley, Dyer, Garrett, Peet, Rundles, Szpak, Tiedman, Wilkinson, and Young; Ms. Baschon, Bodine, Borden, Fields, Kirkland, Marlo, Mosher, Nelson, Rowland, and Wicker; Messrs. Eastwood and Watters

Veterans Administration Research and Development

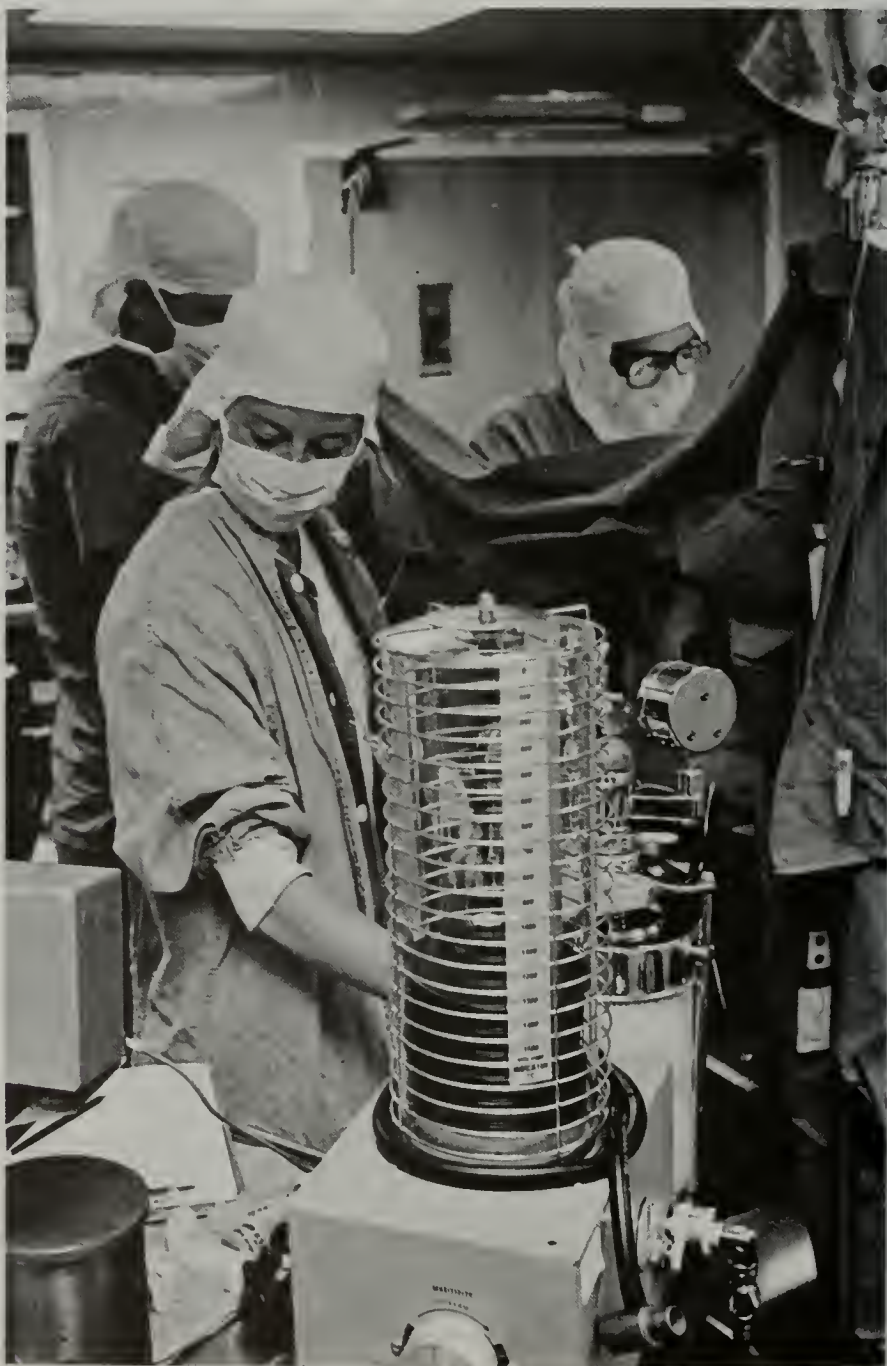
Harvey J. Cohen, M.D., *Chairman*; Drs. Cavenar, Cobb, Duncan, Fowler, Fuchs, Grant, Halvorsen, Postlethwait, Sage, Shelburne, Velez, and Yarger

Vice-President's Veterans Administration

William G. Anlyan, M.D., *Chairman*; Richard S. Kramer, M.D., *Vice-Chairman*; Drs. Busse, Cavenar, Christakos, Cohen, Estes, Feussner, Fuchs, Harmel, Jennings, Postlethwait, Pratt, Putman, Sabiston, Takaro, William Thompson, Tiedman, and Wallace; Messrs. Brown and Shytle; Ms. Fowler and Wilson



General Information



History

I have selected Duke University as one of the principal objects of this trust because I recognize that education, when conducted along sane and practical, as opposed to dogmatic and theoretical, lines is, next to religion, the greatest civilizing influence.

I have selected hospitals as another of the principal objects of this trust because I recognize that they have become indispensable institutions, not only by way of ministering to the comfort of the sick, but in increasing the efficiency of mankind and prolonging human life

James Buchanan Duke, Indenture of The Duke Endowment, 1924

By establishing the Duke Endowment, James Buchanan Duke expressed his hope that adequate and convenient hospital care would become available to all Americans. His further bequests provided for the opening, in 1930, of the School of Medicine, School of Nursing, and hospital which today are the core institutions of the Duke University Medical Center. By opening the first major outpatient clinics in the region in 1930, Duke recognized its responsibility for providing quality care to the people of the Carolinas. The Private Diagnostic Clinic, organized in 1932, not only provided coordinated medical and surgical care to private patients with moderate incomes but also allowed members of the medical faculty to contribute a portion of their earnings toward the continued excellence of medicine at Duke. In less than five years Duke was ranked among the top 25 percent of medical schools in the country by the Association of American Medical Colleges.

Building on this heritage, the Duke University Medical Center ranks among the outstanding health care centers of the world. Its pioneering medical curriculum, instituted in 1966, features a generous measure of elective course selection in the belief that all health professionals must be prepared for a lifetime of self-education. The scientific grounding for that education is provided through participation in a wide variety of ongoing research programs. The opening of Duke Hospital North in 1980 makes the Duke Hospital, with 1,008 beds, one of the most modern patient care facilities anywhere available. The combined strength of its teaching, research, and hospital care programs represents the continuing fulfillment of the dream of James Buchanan Duke.

Over the years the Medical Center has been enlarged and its programs expanded by new construction and by the acquisition of, and affiliation with, established hospitals.

Currently the Medical Center at Duke University occupies approximately 140 acres on the West Campus. The southern quadrant is contiguous with the main quadrangle of the University and consists of the following: *Davison Building*—Department of Pathology, Central Teaching Facility, Division of Audiovisual Education, Medical Center Administration, Student Lounge, School of Medicine,



Office of Admissions, and departmental research laboratories and offices. *Duke Hospital South*—inpatient care units, in- and outpatient diagnostic, treatment and support services including operating rooms, recovery room and laboratories, nursing service administration, amphitheater, chapel, private diagnostic clinics, outpatient clinics, departmental offices; *Baker House*—Departments of Medicine, Anesthesiology, Obstetrics and Gynecology, outpatient diagnostic, treatment and support services including speech and hearing, and pastoral care and counseling; *Barnes Woodhall Building*—inpatient care units, in- and outpatient diagnostic, treatment and support services including labor and delivery room and radiology, hospital administration, Department of Radiology, departmental offices; *Diagnostic and Treatment Building*—clinics, in- and outpatient diagnostic, treatment and support services, departmental research laboratories and offices; *Gerontology Building*—Center for the Study of Aging and Human Development, treatment and support services, departmental research laboratories and offices; *Eugene A. Stead Building (CR-1)*—inpatient care unit (research), departmental research laboratories and offices; *Clinical Research II*—hyperbaric medicine unit, departmental research laboratories and offices, clinical cancer research unit and the Department of Psychiatry; *Edwin A. Morris Clinical Cancer Research Building*—Inpatient care unit (research), clinics, diagnostic treatment and support services including Division of Radiation Oncology, departmental research laboratories and offices.

The northern quadrant has the following buildings: *Nanaline H. Duke Medical Sciences Building*—Departments of Biochemistry, Physiology, and Pharmacology; *Alex H. Sands Medical Sciences Building*—Department of Anatomy and clinical science research programs of the Departments of Medicine, Surgery, Psychiatry, and Anesthesiology; *Edwin L. Jones Basic Cancer Research Building*—Director of Comprehensive Cancer Center, Department of Microbiology and Immunology and basic science research programs of Medicine, Surgery, Pediatrics, Obstetrics-Gynecology, Anatomy, and Pathology; *Medical Research Building*—offices and laboratories of Radiology; *Bell Building*—offices and laboratories of Medicine, Surgery, Pediatrics, Radiology, Anatomy, and Ophthalmology. It also houses Information Services, and the gross anatomy laboratories; *Seeley G. Mudd Communications Center and Library*—Medical Center Library, the Trent Collection of the History of Medicine and the Department of Public Relations; *Searle Center for Continuing Education*; *Eye Center*—inpatient care units, eye clinic, diagnostic, treatment and support services including operating rooms, recovery, Department of Ophthalmology, departmental

research laboratories and offices; *Duke Hospital North*—inpatient care units, diagnostic, treatment, and support services including operating rooms and recovery, Radiology, laboratories, Departments of Surgery and Pediatrics, departmental offices.

In the western quadrant of the campus are: *Research Park Buildings I, II, III, and IV*—offices and laboratories of Medicine, Surgery, Pediatrics, Radiology and Microbiology and Immunology; *Vivarium*—Division of Laboratory Animal Resources and laboratory animal care facilities; *Animal and Laboratory Isolation Facility*—special containment facility for cancer research.

In the eastern quadrant of the campus are: *Pickens Rehabilitation Center*—general and rehabilitation outpatient clinics; Student Health Service, Employee Health Service, and Faculty Family Health Service; *Civitan Mental Retardation and Child Development Center*—offices, clinics, and laboratories of Psychiatry and Pediatrics; *Trent Drive Hall*—Health Administration and Department of Community and Family Medicine.

The goal of the Duke University Medical Center is to be a leader in contemporary medicine. This involves maintaining superiority in its four primary functions—unexcelled patient care, dedication to educational programs, national and international distinction in the quality of research, and service to the region.

Growth is identified with deeper involvement in the social aspects of health, the establishment of advanced therapeutic and research facilities, and a medical teaching program that has attracted the attention of educators around the world.

Resources for Study

Library/Communications Center. The Medical Center Library/Communications Center is located in the Seeley G. Mudd Building, midway between the north and south Medical Center campuses.

The Medical Center Library attempts to provide all informational services and collections necessary to further educational, research, and clinical activities in the medical field. The collection of approximately 191,000 volumes and 2,500 current journal subscriptions is freely available for use by Medical Center students and personnel; study accommodations for 500 readers includes extensive provisions for audiovisual learning. The library also includes the Trent Collection which is unsurpassed in the southeast as a resource for study of the history of medicine, and a branch collection of books and journals maintained in the Nanaline B. Duke Medical Sciences Building.

The Medical Center Library is open: Monday-Friday, 8:30 A.M.-midnight; Saturday, 8:30 A.M.-6:00 P.M.; Sunday, 12:00 noon-midnight. Summer and holiday hours are as announced.

Director: Warren P. Bird, M.S. (Columbia, 1964), *Associate Professor of Medical Literature*; Curator of the Trent Collection: G.S.T. Cavanagh, B.S., B.L.S. (McGill, 1951), *Professor of Medical Literature*.

The Medical Center Bookstore offers a wide selection of biomedical textbooks and reference books, as well as an assortment of laboratory and clinical instruments and office supplies. Facilities for browsing in a pleasant atmosphere are available, as are special individualized services. The Bookstore is open: 8:30 A.M.-5:00 P.M., Monday-Friday.

Manager: Ken Baxley

The Searle Center for Continuing Education in the Health Sciences provides accommodations for conferences, symposia, lectures and meetings to support the Continuing Education activities of the Medical Center. Provisions have been made for banquet and food service arrangements to complement the meeting facilities.

Director: Ellen Rock

The Thomas D. Kinney Central Teaching Laboratory. The Thomas D. Kinney Central Teaching Laboratory, formerly the Central Teaching Facility, is



located on the fourth floor of Davison Building where it provides laboratory, demonstration, and conference space for all courses taught in the basic sciences, with the exception of gross anatomy. A full-time staff maintains a wide range of equipment and provides supplies and services necessary for the teaching programs conducted in the facility, thus enabling the academic staff of each department to devote its efforts entirely toward the students.

Six unit laboratories, each accommodating twenty students, and a twelve-person M.D.-Ph.D. candidate laboratory are devoted to instruction for the first year. All first year medical students are given space in one of these laboratories for their own work which they maintain for the entire academic year. Four small laboratories are interspersed between the six unit laboratories and provide space for large pieces of equipment used in conjunction with exercises conducted in the unit laboratories. Space is also provided for small laboratory projects. Three large multipurpose laboratories can accommodate forty or more students each for a large variety of teaching exercises. Other areas include demonstration and conference rooms and a microscopy laboratory for advanced courses offered during the third year.

The Central Teaching Laboratory also provides resources for allied health programs and a microscope cleaning service. Five large conference rooms in Duke South and fourteen conference rooms in Duke North are scheduled through this office, providing additional teaching space for groups of 16 to 225 persons when necessary.

Manager: Carol G. Reilly, B.S.

Division of Audiovisual Education. The Division of Audiovisual Education serves the Medical Center by providing all types of audiovisual materials to assist the faculty. There are three subdivisions: the Medical Art Facility, the Medical Photography Facility, and the Central Television Facility.

The Medical Art Facility provides illustrations produced by various art methods and techniques. Services rendered are medical illustrations, schematic and

mechanical drawings, diagrams, charts, graphs, designs, lettering, signs, and poster exhibits, as well as other forms of illustrations.

The Medical Photography Facility is staffed and equipped to provide all photographs needed for patient care, for teaching, and for research. For example, photographers take pictures of patients, including such fine details as the patterns of vessels on the retina. Standard sized slides, transparencies, and prints are produced as requested for lecture, publication, and exhibit purposes.

The Central Television Facility also provides services for teaching, research, and patient-care programs. The three-fourths inch video format is used for color recording of procedures for patient education and of lecture presentations as part of staff continuing education. Closed-circuit TV is used for remote observation of surgery by students and staff in the North Division. Motion pictures in color and with sound are also produced by this section. Audiotape services, projectionists, and projectors are available.

Director: Thomas P. Hurtgen, M.B.A.

Duke Hospital. Duke Hospital, one of the largest private hospitals in the south, is part of the Medical Center and currently has 1,008 beds. The hospital directs its efforts toward the three goals of expert patient care, professional education, and service to the community. It offers patients modern comprehensive diagnostic and treatment facilities and special acute care and intensive nursing units for seriously ill patients. More than 30,000 patients are admitted annually. Surgical facilities include thirty-two operating rooms in which surgeons perform more than 16,000 operative procedures annually. Approximately 1,800 babies are born each year in the delivery suite. Other special facilities for patients include a heart catheterization laboratory, hemodialysis unit, cancer research unit, pulmonary care unit, hyperbaric oxygenation chamber, and cardiac care unit.

Close working relationships with private and governmental health and welfare agencies provide opportunities for continued care of patients after they leave Duke Hospital.

Ambulatory services include the nonprivate outpatient clinics, private diagnostic clinics, the employee health service, and the emergency department, with annual total patient visits of over 400,000. The clinical faculty of the Duke University School of Medicine participate in undergraduate and graduate medical education and practice medicine in the hospital and in private diagnostic clinics.

Duke Hospital, with a house staff of approximately 579, is approved for internship and residency training by the Council on Medical Education and Hospitals of the American Medical Association and is fully accredited by the Joint Commission on Accreditation of Hospitals.

Veterans Administration Medical Center. The Durham Veterans Administration Medical Center, with 489 beds, annually admits over 7,000 patients. The hospital is within walking distance from the School of Medicine and has closely integrated teaching and training programs for medical students and house staff. These programs are provided by the full-time professional staff who are members of the faculty of Duke University School of Medicine.

Sea Level Hospital. Sea Level Hospital in Carteret County, North Carolina, became part of Duke University Medical Center in 1969 as a result of a gift by D. E. Taylor and family of West Palm Beach, Florida. The seventy-two-bed community hospital retains its professional and administrative staff, with representatives of the Medical Center serving in an advisory capacity. It provides an opportunity for medical students to obtain experience in the practice of medicine in a small community.

Lenox D. Baker North Carolina Crippled Children's Hospital. The Lenox D. Baker North Carolina Cerebral Palsy Hospital, with forty beds, is a residential



rehabilitation center for children with neuromuscular and skeletal diseases, primarily cerebral palsy. Although it is a state institution, physicians on the faculty of the Duke University Medical Center conduct interdepartmental teaching and training programs for house staff, medical students, and the Cerebral Palsy Hospital staff.

Durham County General Hospital. Durham County General Hospital is a county owned, 483-bed, general, short-term care community facility serving the residents of Durham County. This institution participates in many of the medical and health-related professional training experiences.

Other Hospitals. Various cooperative teaching and training programs are available for medical and allied health professional students and house staff at other hospitals including McPherson Hospital in Durham, Asheville Veterans Administration Hospital in Buncombe County, Murdoch Center for Retarded Children and John Umstead Hospital in Butner, Dorothea Dix Hospital in Raleigh, and Cabarrus Memorial Hospital in Concord, North Carolina.

Program Information



The Medical Curriculum

In recent years, analysis and appraisal of medical curricula have resulted in changes in many medical schools. Several factors have required these changes. Important among them are the increasing scope and complexity of medicine generally and the dissatisfaction with the sharp cleavage between basic science and clinical years. As a result of long study, the Duke University School of Medicine instituted a major revision of the curriculum, beginning with the class which entered in the fall of 1966.

The aims of the present curriculum are: (1) to provide a strong academic basis for a lifetime of growth within the profession of medicine, with the development of technical competence, proficiency, and the proper attitudes peculiar to the practice of medicine as well as an appreciation of the broader social and service responsibilities; (2) to establish for the first year a basic science program which will fulfill the purposes of the increasingly heterogeneous student body; (3) to offer both clinical and basic science education simultaneously; (4) to permit the student to explore personal intellectual preferences and capabilities; (5) to allow indepth study in selected areas, either clinical or basic science; (6) to provide greater freedom of course selection and thus to encourage earlier career decision; and (7) to achieve better integration of the medical school curriculum with residency training and the practice of medicine.

The curriculum, while offering a previously unattainable degree of flexibility to medical education and new opportunities for intellectual exploration, also makes heavy demands upon the student. It should be recognized that medical students at the Duke University School of Medicine are expected to maintain a consistent level of performance and to demonstrate qualities of initiative and dedication to their chosen profession. A scholarly attitude toward medicine that will continue throughout an entire career is an important objective of the Medical School. The foundations of this attitude to learning should accompany the student upon entering.

Students are expected to maintain at all times a professional attitude toward patients, to respect confidences, and to recognize that they are the recipients of privileged information only to be discussed within the context of scholarship and in circumstances that truly contribute to the educational process or to the care of the patient. This attitude involves consideration not only of speech and personal appearance but also of morality, honor, and integrity.

Doctor of Medicine Degree

The degree of Doctor of Medicine is awarded, upon approval by the faculty of Duke University, to those students who have completed the curriculum of the School of Medicine and have demonstrated their fitness to practice medicine by adherence to a high standard of ethical behavior and morality. Only those who have paid or made satisfactory arrangements to pay all indebtedness to the University will be awarded their degrees.

Course Requirements—First Year. The student will study the principles of all the basic science disciplines. Rather than mastering an encyclopedic array of facts, the purpose will be to acquire familiarity with the major principles of each subject. An introduction to clinical medicine will be presented by the clinical services. The year will be divided into two terms of instruction, of eighteen weeks and twenty-three weeks, as follows:

Semester 1	Credit
Gross Anatomy	3
Microanatomy	3
Neuroanatomy	2
Biochemistry	5
Physiology	5
Genetics	<u>1</u>
	19
Semester 2	Credit
Pathology	5
Microbiology	5
Introduction to Clinical Diagnosis: Laboratory, Physical, and Radiologic Diagnosis	5
Pharmacology	4
Human Behavior	2
Community and Family Medicine	1
Immunology	<u>1</u>
	23

Course Requirements—Second Year. Satisfactory completion of the first year curriculum is a prerequisite to the second year curriculum. The second year will provide an exposure to clinical science disciplines, which permits students early in their careers to become participants in the care of patients. The acquired appreciation of the problems of the clinical areas and the opportunities to recognize the applications of the basic sciences should lead to a more meaningful selection of courses for the subsequent two years. The second year will be divided into six terms of eight weeks each—medicine, obstetrics, pediatrics, psychiatry, surgery, and family medicine.

Course Requirements—Third and Fourth Years. Satisfactory completion of the second year curriculum is a prerequisite to the elective curriculum. These two years will be made up of elective courses, selected by the student within requisite limitations. Each student will choose professional advisers from the preclinical and clinical faculties to assist in formulating the program for the third and fourth years. Half of the time must be devoted to basic science and half to clinical science. Recipients of a Ph.D. degree in a basic science subject or completion of one of the special study programs may fulfill the requirements for basic science.

The elective courses of study offered are described under each department. The wide selection affords an opportunity for students to design programs to best satisfy their needs, with guidance from their advisers. Thirty-six credits in each elective curriculum, i.e., basic science and clinical science, are required for graduation.



As an alternative after completion of the second year, the student may enroll as a Ph.D. candidate in one of the basic sciences, earning this degree in two or three years. Then, having completed three of the four years necessary for a Doctor of Medicine degree, the student may earn that degree by completing a fourth clinical year.

The third and fourth years will be divided into four terms of sixteen weeks each. Certain courses as noted will be offered during the summer term.

Promotion. Certification by the individual faculty person or by the delegated representative of each departmental Chairman where appropriate that a student has satisfactorily completed requirements for a course shall constitute grounds for a grade of "passing" or a grade of "passing with honors." "Passing with honors" is reserved for those students who have performed in an extraordinary manner in the opinion of the faculty.

An "incomplete" grade shall be reserved for those students who have not met all of the requirements because of illness or other such extenuating circumstances. "Incompletes" that are not satisfied within one calendar year automatically become "failures." It is the departmental chairman's responsibility or that of the delegated representative of the departmental Chairman to certify that an "incomplete" has been satisfied and to so notify the Registrar and Dean for Undergraduate Medical Education. A "passing grade" shall be placed alongside an "incomplete" on the permanent and official transcript. All first year courses must be satisfactorily completed before a student may enroll in second year courses. All

second year courses must be satisfactorily completed before a student may enroll in the elective curriculum.

A "fail" grade is recorded on the permanent record of a student by the Registrar upon certification by the individual faculty person or the delegated representative of the departmental chairman that unsatisfactory work has been done in the opinion of the faculty. Failures cannot be erased from the permanent record but the requirements of the course may be satisfied by repeating the course in a satisfactory manner at which time a passing grade is placed alongside the grade of "fail" on the official and permanent transcript.

Each student's record will be reviewed periodically by promotions committees composed of the departmental chairmen. There will be two such committees: one for basic science and one for clinical science. Recommendations by these committees will be made to the Dean of Undergraduate Medical Education who may follow one of several options:

1. Promote students whose work is satisfactory;
2. Warn students whose work is less than satisfactory that they must improve their scholastic endeavor;
3. Place on probation students whose work is unsatisfactory; or
4. Request the resignation of any student who is considered an unpromising candidate for the degree of Doctor of Medicine.

A student wishing to appeal a decision may do so to the Dean of Undergraduate Medical Education within two weeks of notification.

The Dean of Undergraduate Medical Education, with the advice of the Medical School Advisory Committee, reserves the right to require the withdrawal of any student at any time if, in his opinion, the student should not continue in the School of Medicine.

Satisfactory Progress. Satisfactory progress for students in the School of Medicine shall be construed as the successful completion of all requirements necessary for the advancement from one year to the next. These requirements are as follows:

First to Second Year. Completion of core basic science courses and introduction to clinical medicine.

Second to Third Year. Completion of core clinical science courses within fourteen months.

Third to Fourth Year. Completion of 36 elective course credits within one calendar year.

Fourth Year to Graduation. Completion of an additional 36 elective credits within one calendar year.

Leave of Absence. With the approval of the Dean of Undergraduate Medical Education, or the Assistant Dean for Medical Student Affairs, a student may be granted an official leave of absence for two or more consecutive terms but not to exceed one calendar year. In the following circumstances a student must request a leave of absence: a freshman who will not be enrolled for the entire first year; a sophomore who will not be enrolled during an entire term and, thereby, not complete the core clinical science courses within fourteen months; and a third or fourth year student who will not be enrolled for consecutive terms in the fall, spring, and/or summer.

A student who does not enroll for a period longer than one year must seek readmission by application to the Medical School Admissions Committee.

Combined Degree Programs

Medical Scientist Training Program. The Medical Scientist Training Program is designed for highly qualified students strongly motivated toward a career

in medical sciences and academic medicine. It provides an opportunity to integrate graduate education in one of the sciences basic to medicine with the full clinical curriculum of the School of Medicine. The program requires, on the average, six to seven years of study and leads to both the M.D. and Ph.D. degrees. Although the special emphasis of this program is on basic medical science, the trainees, because of their education in clinical medicine, have a remarkable range of career opportunities open to them. Graduates of this program follow one of two broad paths. Some embark directly on careers in teaching and research in one of the basic medical sciences, while maintaining strong ties with clinical science as a result of their combined training. Others enter residency programs before pursuing investigative and teaching careers in clinical medicine, carrying with them strong academic backgrounds which allow them to conduct fundamental research with a foundation of superior training and experience in basic sciences.

Eligibility. Applicants must meet the admission requirements of both the Medical School as a candidate for the M.D. degree, and the Graduate School as a candidate for the Ph.D. degree. Most candidates apply for admission to the first year of the program, but in special cases applications can be accepted from students who are in residence in the Medical School or Graduate School of Duke University. In addition to the minimum requirements for acceptance to the Medical School and the Graduate School, advanced course work in science and mathematics and prior research experience (or other evidence of research aptitude) will count heavily in the selection of candidates.

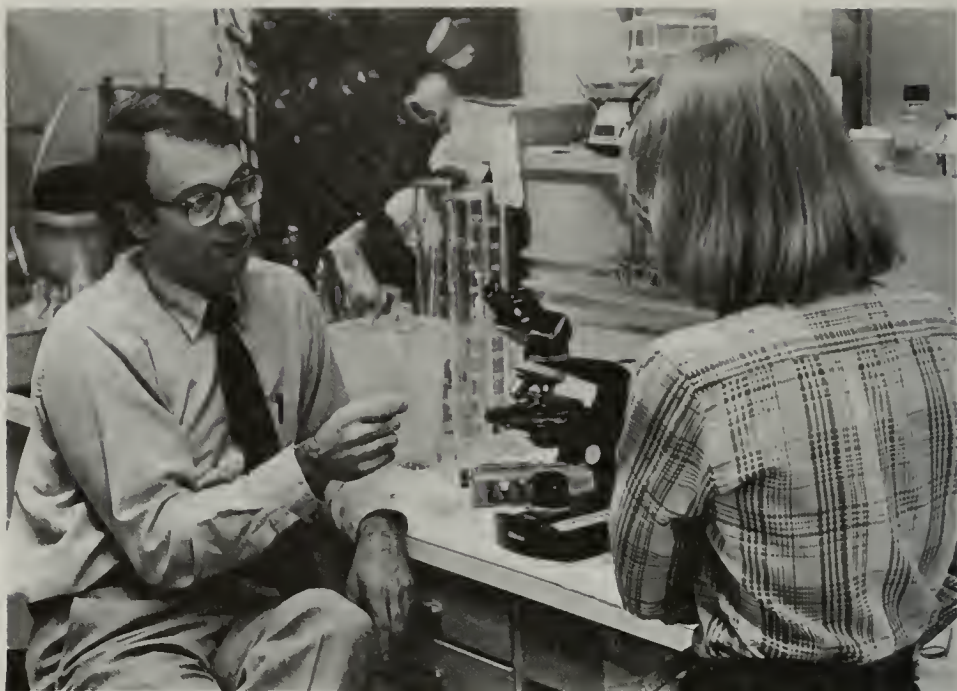
Financial Support. Students admitted to the first year of the program will receive a traineeship award, consisting of a stipend and full tuition allowance, provided by a National Research Service Award from the National Institutes of Health. Currently the annual stipend, defined by NIH policy, is \$5,040, and financial support from that award can be furnished for up to six years, assuming normal progress.

The Training Program. This program has been designed to offer trainees great latitude in the selection of course material. Basic requirements are two academic years composed of the first basic science year and the second clinical science year of the curriculum for medical students at Duke University. Following completion of the second year, the trainee enters the graduate program to complete the requirements for the Ph.D. degree. One more academic year of elective clinical study is necessary to complete the requirements for the M.D. degree. Both degrees are awarded at the completion of this sequence. Minor variations in this schedule can be arranged if this is advantageous to the student's education.

Year 1—Core Basic Science Year. This year consists of courses in anatomy, biochemistry, genetics, microbiology, pathology, pharmacology, and physiology. An introduction to clinical methods concludes the first year. Students in the Medical Scientists Training Program work together throughout the first year, during which time they are encouraged to select their fields of graduate study. In the summer between the first and second years, trainees normally will be expected to begin the second year clinical rotations.

Year 2—Core Clinical Science Year. This year encompasses a comprehensive approach to medicine oriented to the patient as a whole. The year provides fundamental training in clinical medicine, with emphasis on the relationships between general biological processes, from conception through birth, development, and maturation to senescence and death, as well as individual clinical states. Special consideration is devoted to the pattern of developmental sequences and to the changes in that pattern determined by genetic composition and the particular environment in which the patient lives.

During the second year, the trainee is taught primarily by teacher-investigators from the clinical departments. The core clinical year is divided into six terms



of eight weeks each, encompassing medicine, obstetrics, pediatrics, psychiatry, surgery, and family medicine. These may be taken in any sequence.

Years 3, 4, 5, (6)—The Graduate Years. During the third, fourth, and fifth and, if necessary, sixth year of the program, the trainee pursues graduate study to satisfy the requirements for the Ph.D. degree. These requirements include: (1) completion of necessary course work, (2) adequate performance in the preliminary examination, (3) original research suitable for a dissertation, and (4) successful defense of the thesis in the final examination. Detailed description of the other general requirements for the Ph.D. degree are stated in the *Bulletin of the Graduate School*.

The graduate curriculum of each trainee is developed in consultation with the director of graduate studies of the department in which the trainee elects to study and requires the approval of the Medical Scientist Training Program Committee. Since most of the ordering ideas and experimental techniques of all the medical sciences derive from mathematics and the physical sciences, it is essential to ensure that all students in the program have an adequate foundation in these subjects. Because of the close working relationship and geographical proximity of the departments of medical and physical sciences at Duke, the setting is unusually favorable for the achievement of that goal.

Descriptions of the graduate courses in the Departments of Anatomy, Pathology, Microbiology, Biochemistry, Genetics, Physiology, Pharmacology, Biomedical Engineering, and Computer Science are listed in the *Bulletin of the Graduate School*. Trainees are encouraged to select courses which relate to their developing individual interests rather than follow a prescribed curriculum applied to all students in a given discipline. Such range, flexibility, and freedom are the essence of graduate education. The original research and dissertation of each trainee is supervised by a faculty adviser chosen by the trainee in consultation with the Director of Graduate Studies in the appropriate department. The faculty adviser is the chairman of the trainee's supervisory committee, which consists of at

least three members from the major department. This committee generally administers the preliminary examination before the student commences original research and the final examination after the student completes the dissertation.

Final Year—An Elective Year in Clinical Science. In this year, which is entered only after completion of all requirements for the Ph.D. degree, a faculty adviser from the clinical discipline in which the student is most interested is assigned. The student and the adviser construct an individualized curriculum, which often places major emphasis on one clinical area and minor emphasis on other fields. One aim is the integration of research interests and clinical experience in such a way that the student's research competence will be facilitated; therefore, this year is planned with regard to the trainee's proposed career in research as well. This elective year provides further training in clinical medicine to complement the second or core clinical year, so that the trainee's total clinical experience is the same as that given in the regular clinical years of medical school (the third and fourth years in the majority of schools). It should be noted that since students in the program receive the M.D. degree upon completion of this final year, great care is taken by the faculty to ensure that students are competent and knowledgeable in current concepts of patient care. It is hoped that the final year will provide the student with an experience which is not repeated during the residency but will serve to complement later phases of training. Thus, future surgeons might be exposed to fields other than surgery, since they will receive intensive training in that discipline during their residency programs.

Application and Admission Procedure. The following guidelines should be observed by individuals applying to the Medical Scientist Training Program.

1. The application form for the Duke University School of Medicine should be completed and submitted as early as possible. Since acceptance into the Medical Scientist Training Program is contingent upon acceptance into the School of Medicine, all candidates are first considered to be applicants to the School of Medicine.
2. The application form for the Medical Scientist Training Program should be completed and submitted with the application to the School of Medicine. *To ensure full consideration by the Program Selection Committee, this application should be mailed no later than 1 November.*
3. To facilitate review of this application, the Medical College Admission Test should be taken, if possible, in May of the year in which the application is submitted.
4. Only those applicants who are accepted for the program are requested to complete an application form for the Graduate School. The Graduate Record Examination is not required for this purpose.
5. Applicants are notified about acceptance into the program on or about 15 February.

Additional information may be obtained by writing Henry Kamin, Ph.D., Associate Director, Medical Scientist Training Program, Department of Biochemistry, Duke University Medical Center, Durham, North Carolina 27710.

The Medical Historian Program. The Medical Historian Program is conducted under the auspices of the School of Medicine and the Graduate School. Two courses are offered: a combined M.D.-Ph.D. (extending over six years) and a M.D.-M.A. (four or five years depending on use of summer sessions). The choice of Ph.D. or M.A. depends on the career goals of the student. Those wishing to put a major effort into scholarly activities in the history of medicine will generally be advised to undertake the Ph.D. The M.A., taken separately from the M.D., will be attractive to physicians already in practice who wish to pursue an interest in the history of medicine more effectively.

The basic requirements for both courses are two academic years in the School of Medicine consisting of core basic sciences in the first year and core clinical rotations in the second year. The student then enters the Department of History. A range of appropriate courses are available. Following the completion of the Ph.D. or M.A., the student resumes requirements for the M.D. degree.

Application and Admissions Procedures. Applicants must meet the requirements for admission to the School of Medicine and the Graduate School in the Department of History. Candidates who have completed two years of medical school will also be considered. In addition to the minimum requirements established by the School of Medicine and the Graduate School, courses in history and in the history and philosophy of science will count in the selection of candidates.

Applicants should complete and submit an application form to the Duke University School of Medicine. After acceptance, selected candidates will be requested to submit an application to the Graduate School for admission to the Department of History.

Additional information may be obtained by writing to the Director, Medical Historian Program, Box 3702, Duke University Medical Center, Durham, North Carolina 27710.

The Medicine and Public Policy Program. This program, which normally requires a maximum of five years to complete, is offered to meet the growing demand for persons who combine medical skills and training with a capacity for analytic public decision-making. It aims at training those persons with requisite talent to be leaders in the development and implementation of health policy at all levels of government. Such leadership might be provided as an elected or career public official, as a leader of medical professional organizations, or as a practicing physician or medical scholar active in public affairs.

Utilizing the faculty and resources of the School of Medicine and the Institute of Policy Sciences and Public Affairs, the program offers students a multidisciplinary education that aims at providing:

1. A complete course of study in basic medical sciences and clinical training in the practice of medicine identical in scope and rigor with the education received by students enrolled in the Doctor of Medicine program alone;
2. Familiarity with the organization and financing of health services, with particular focus on the economics and politics of health care;
3. An understanding of the political, bureaucratic, and social processes that define public problems and limit alternative approaches to their solutions;
4. A capacity for quantitative and logical methods of analysis useful in forecasting and appraising policy consequences and in evaluating existing policies;
5. An understanding of the uses and limitations of various analytic techniques and an awareness of the value considerations and ethical choices implicit in particular policy alternatives.

During the first two years at Duke, students enroll in the normal course of study in the School of Medicine. In the third year, course work shifts primarily to the Institute. In the fourth year, students do most of their work in the School of Medicine and complete a client-oriented study of a particular problem in health policy. During the fifth year, students complete their requirements in the School of Medicine, at the completion of which they receive both the M.D. and A.M. in public policy sciences degrees.

Admissions. Students may apply for admission to the program in medicine and policy sciences concurrent with application to the School of Medicine or during their first or second years.

Applications. Requests for applications and specific questions about the program should be addressed to the Director of Graduate Studies, Institute of Policy

Sciences and Public Affairs, P.O. Box 4875, Duke Station, Durham, North Carolina 27706.

The M.D.-J.D. Program. The School of Medicine and the School of Law of Duke University jointly sponsor a program of combined medical and legal education. The program provides an opportunity to acquire a full basic study of the two fields. Upon satisfactory completion of the required course of study, candidates will be awarded both the M.D. and the J.D. degrees.

Course of Study. The student in the M.D.-J.D. Program begins a six-year course of study in the School of Medicine. As in the regular M.D. Program, the first year is devoted to the basic medical sciences and the second year to the basic clinical disciplines. At this point the student enters the School of Law, where the first-year curriculum is the same as that of other law students. During the next two years the student takes approximately one and one-half semesters in the law curriculum, including available health law courses, and then may apply up to twelve additional hours of medical school courses toward the law degree. The sixth and final year is spent in elective clinical work in the Medical School tailored to the student's specialized needs. In addition, the student completes eighteen semester hours, or two summer sessions, of elective basic science work.

Eligibility. Applicants for the M.D.-J.D. Program must qualify for admission to both the School of Medicine and the School of Law. The usual approach is to apply for both schools simultaneously, thus reserving a place in the program prior to arrival. Applications are also accepted from members of the first and second year medical school class for admission to the School of Law and from the third year law school class for admission to the School of Medicine.

Application Procedure. Application forms for the School of Law may be obtained by writing to the Office of Admissions, Duke University School of Law, Durham, North Carolina 27706. Applications for the School of Medicine may be obtained by writing to the Committee on Admissions, Box 3710, Duke University Medical Center, Durham, North Carolina 27710.

Deadlines. For those seeking simultaneous admission to both schools: spring—at the end of the junior year take the new Medical College Admissions Test (MCAT). June—at the end of the junior year take the the Law School Aptitude Test (LSAT). July—between the junior and senior years, write to the Law and Medical Schools for application forms. August—complete the Medical School application and check the box indicating "M.D.-J.D. Program." The application must be submitted prior to the 1 November deadline. September—complete the application form for the School of Law.

Because of the complexity of the admission procedure outlined above, candidates seeking simultaneous admission are urged to give early attention to appropriate deadlines for the aptitude tests and application forms.

The M.D.-M.P.H. Program. Students enrolled in the School of Medicine, after satisfactory completion of the first two years of the regular curriculum, may request approval to seek a Master of Public Health degree at the University of North Carolina, Chapel Hill, or at another approved institution. The program is designed to train physicians in epidemiology, biostatistics, environmental and occupational health, and in planning, administering, and evaluating health care delivery systems. Upon receipt of the M.P.H. degree, students are awarded one half year (18 units) of elective credit toward the M.D. degree. This credit award, to be made by the Dean for Undergraduate Medical Education, may be prorated between clinical and basic elective units depending upon the course of study pursued by the student.

For additional information, interested students should contact George R. Parkerson, Jr., M.D., M.P.H., Coordinator of Education, Department of Communi-

ty and Family Medicine, Duke University School of Medicine, Durham, North Carolina 27710.

Commencement. Graduation exercises are held once a year, in May, when degrees are conferred on, and diplomas are issued to, those who have completed requirements by the end of the spring semester. Those who complete degree requirements at the end of the fall or summer terms receive diplomas dated 30 December or 1 September, respectively. There is a delay of about one month in the mailing of September and December diplomas because diplomas cannot be issued until they are approved by the Academic Council and the Board of Trustees.

Postgraduate Education

Residencies. Appointments are from 1 July through 30 June with few exceptions. Residents receive stipends, professional liability insurance, disability insurance, life insurance, uniforms, and laundry of uniforms.

Residencies offered with the chairman or chief of each service are as follows:

Anesthesiology.....	(Chm.) Merel H. Harmel, M.D.
Family Medicine.....	(Program Director) Samuel W. Warburton, Jr., M.D.
Internal Medicine.....	(Acting Chm.) David Durack, M.D.
Dermatology.....	(Chf.) Sheldon Pinnell, M.D.
Neurology.....	Allen Roses, M.D.
Obstetrics and Gynecology.....	(Chm.) Charles Hammond, M.D.
Ophthalmology.....	(Chm.) Robert Machemer, M.D.
Pathology.....	(Chm.) Robert Jennings, M.D.
Pediatrics.....	(Chm.) Samuel L. Katz, M.D.
Pediatric Allergy.....	Rebecca Buckley, M.D.
Pediatric Cardiology.....	Madison S. Spach, M.D.
Psychiatry.....	Jeffrey Houpt, M.D.
Radiology.....	(Chm.) Charles Putnam, M.D.
Imaging.....	Carl Ravin, M.D.
Nuclear Medicine.....	R. Edward Coleman, M.D.
Radiology Oncology.....	Leonard Prosnitz, M.D.
Surgery.....	(Chm.) David C. Sabiston, Jr., M.D.
General Surgery.....	William G. Shingleton, M.D.
Neurosurgery.....	Robert H. Wilkins, M.D.
Oral Surgery.....	Nicholas G. Georgiade, D.D.S., M.D.
Orthopaedic Surgery.....	J. Leonard Goldner, M.D.
Otolaryngology.....	William R. Hudson, M.D.
Plastic Surgery.....	Nicholas G. Georgiade, D.D.S., M.D.
Thoracic Surgery.....	David C. Sabiston, Jr., M.D.
Urologic Surgery.....	David F. Paulson, M.D.

Duke University Medical Center is a participating member of the National Intern and Resident Matching Program, 2530 North Ridge Avenue, Evanston, Illinois 60201, and all applicants for first-year post-medical school appointments must register with this program.

Both men and women graduates of any L.C.G.M.E.-accredited medical school are eligible for appointment and all applicants will be considered without regard to race, color, religion, sex, or national origin.

Requests for application forms and information about straight residencies should be addressed to the Chairman of the service under which training is desired. A transcript of the medical school record is required, and must either accompany the application or be furnished by the Dean of the Medical School.

Graduates of medical schools outside the United States and Canada must hold or be eligible for the standard certificate of the Educational Commission for Foreign Medical Graduates (ECFMG), 3624 Market Street, Philadelphia, Pennsylvania 19104, to be considered for appointment to residencies. Physicians who are not U.S. citizens or permanent residents may need to pass the Visa Qualifying Exam (VQE) to be eligible for a visa. First-year positions are rarely available for

foreign medical graduates. For further information contact Catheryn Cotten, Office of International Affairs, Box 3882, Duke University Medical Center, Durham, North Carolina 27710.

A North Carolina license is required for all appointees.

Reasonable requests for reduced scheduling will be considered. Inquiries should be directed to the training program directors of approved residencies or to the Office of House Staff Affairs. For further information, please contact Mary C. Fendt, Administrative Assistant, House Staff Office, Box 3951, Duke Medical Center, Durham, North Carolina 27710.

The Durham Veterans Administration Medical Center adjoins the Duke University Campus and is operated under the supervision of the Vice-President's Committee of the Duke University Medical Center. The full-time professional staff of the V.A. Medical Center are all faculty members of the School of Medicine. All training programs are integrated with corresponding programs at the Duke University Medical Center, including rotation of house officers at each hospital.

All residents and clinical fellows are required to be licensed by the State of North Carolina. This may be accomplished by (1) a residency training license (fee \$10) that covers only training by Duke and is not convertible to a full North Carolina license or (2) a full North Carolina license (fee \$100) that is a complete medical license obtained either by State Boards or National Boards and is fully reciprocal with other states for full licenses. Duke Medical Center cannot make applications for house staff. Since house staff members must have the license before beginning duties, arrangements for the license should be made in advance. For additional licensure information, contact Bryant Paris, North Carolina State Board of Medical Examiners, 222 North Person Street, Raleigh, North Carolina 27601.

Application forms and information for residencies or fellowships may be obtained by writing the chairman of the appropriate department, Duke University Medical Center, Durham, North Carolina 27710.

Continuing Medical Education. Numerous formal postgraduate courses are given throughout the entire year for physicians in general practice as well as in all specialties. Conferences and tutorial seminars are also available to any physician who desires to attend and participate. Physicians in practice may make arrangements for a period of one day or more for courses tailored to their particular interests. These personal contacts with senior faculty and residents, including patient examinations as well as follow-up care, provide in-house training experience.

The annual one-week course held in Atlantic Beach in mid-July continues to be one of the most well-attended programs in the region.

For additional information, please contact Harry A. Gallis, M.D., Director, Continuing Education, Duke University School of Medicine, Box 3306, Durham, North Carolina 27710, (919) 684-6878.

Student Life



The University

Duke University, located in Durham, North Carolina, has an enrollment of 9,936 students from all fifty states and from many foreign countries. Currently, Trinity College of Arts and Sciences, the Graduate School, and the Schools of Business Administration, Divinity, Engineering, Forestry, Law, Medicine, and Nursing comprise the University.

Durham, with a population of approximately 100,000, is in the Piedmont region of North Carolina, which has easy access to the sea coast and mountains. It is one of the three cities bounding the Research Triangle Park where numerous private research laboratories and governmental agencies are located. Duke University is twenty-five miles from North Carolina State University in Raleigh and eight miles from the University of North Carolina at Chapel Hill.

Conduct of Students

Duke University expects and will require of all its students cooperation in developing and maintaining high standards of scholarship and conduct.

All students are subject to the rules and regulations of the University which are currently in effect, or which, from time to time, are put into effect by the appropriate authorities of the University.

Any student, in accepting admission, indicates the willingness to subscribe to and be governed by these rules and regulations and acknowledges the right of the University to take such disciplinary action, including suspension and/or expulsion, as may be deemed appropriate, for failure to abide by such rules and regulations, or for conduct adjudged unsatisfactory or detrimental to the University.

Living Accommodations

Duke University responds to the housing needs of graduate and professional students in several ways. Accommodations are available to single students in thirty-two Town House Apartments and six modular homes, and to both single and married students in one-, two-, and three-bedroom Central Campus Apartments. Each of these residential locations is conveniently within walking or biking distance of all University facilities and provides a more home-like atmosphere as an alternative to the living environment inherent in residence halls. All these accommodations are available for continuous occupancy throughout the calendar year.

Rooms in the residence halls are available to graduate and professional students during summer school sessions only.

Town House Apartments. The attractive architecture and setting of the Town House Apartments offer the single graduate and professional student respite from normal campus life and activities. These apartments are more spacious than most apartments found on campus or in Durham. Each apartment is air-conditioned and completely furnished; ample closet and storage space are provided within each apartment. All of these two-bedroom apartments are furnished for two-person occupancy. A swimming pool located in the center of the complex is open in the late spring and summer seasons.

Modular Homes. The University owns six, prefabricated modular homes that are located one block from the main East-West Campus bus line. The three-bedroom homes are completely furnished for three-person occupancy, they provide more privacy than most apartments and have proven to be very popular.

Occupants of Town House Apartments and modular homes must make arrangements with local utility companies to pay for gas, electricity, and telephone service. These companies usually require a deposit when initial applications for service are made. (Only Town House Apartments use gas.)

Central Campus Apartments. During 1975 Duke University completed a 500-unit apartment complex. Designed in the "community style," these apartments provide economy and convenience to both single and married students of all student categories. All utilities except for telephone service are provided in the rates for these one-, two-, and three-bedroom apartments.

Spaces in apartments for single students are provided on an individual basis with each student paying rent per academic term to the University. This method permits students to share apartments with others of their choice. When this is impractical, the Department of Housing Management strives to place persons of like interests together. Single student apartments are completely furnished; an itemization of furnishings is included with the floor plans sent out in the application packet.

Central Campus Apartments are provided to married students on a lease basis and each household is responsible for monthly rental payments as specified by the lease. Married students may request unfurnished or partially furnished one-, two-, or three-bedroom apartments, the size of the apartment being congruent to family size.

Application Procedures. When students are informed of their acceptance to the Medical School they will also receive a postcard on which to indicate preference for University housing. This postcard should be returned to the Department of Housing Management. Detailed information on the types of accommodations and application forms will be forwarded to the accepted student. Assignment to all University housing is made on a first-apply, first-assigned basis.

Off-campus Housing. The Department of Housing Management maintains a listing of rental apartments, rooms and houses provided by property owners or real estate agencies in Durham. These listings are available in the department only; during the summer an assistant is available to answer questions and aid students in their attempt to obtain housing off campus. Except for assuring that owners sign a statement of nondiscrimination, off-campus property is in no way verified and neither the University nor its agents negotiate between owners and interested parties.

Due to a shortage of available housing in the Durham area, the search for accommodations should begin as soon as possible after acceptance to the Medical School. A visit of two or three days will allow you the opportunity to make use of the off-campus service and to inspect personally the availabilities.

Dining Facilities. The Medical Center cafeteria serves students and employees. Other dining facilities located on campus near the Medical Center provide settings for every style of dining, whether a hamburger or prime rib served to your taste. Visit one of the cafeterias at Trent, East or West Union; or stroll through the beautiful, new Bryan Center with its Rathskeller and Snack Bar; or relax in the comfort of the Oak Room. See the section on dining facilities in the chapter, "Financial Information" for approximate food costs.

Services Available

Student Personal Advisory Program. One important objective of Duke University School of Medicine is to promote an informal, cordial student-faculty relationship. All entering students are matched on a voluntary basis to advisers who share mutual interests. These faculty advisers will be available to the students throughout their undergraduate medical education. Advisers are assigned from a group of faculty members who have volunteered to serve in this capacity.

Student Health Service. In recognition of the unique health needs of medical students whose activities bring them into far greater contact with communicable disease than the average university student, a special health program for medical students has been established. Each freshman will submit, prior to entry, the standard Duke History and Physical Examination form to be completed by a physician. This will include urinalysis and hemoglobin. Before entry into the first year class, all students must present written proof of current immunization status. A special form will be provided for this purpose. Immunization procedures required *before* matriculation include polio, mumps-measles, rubella, diphtheria-tetanus booster, and IPPD tuberculin test. The IPPD will be repeated in the junior year.

Students receive ambulatory care at the Student Health Clinic during regular office hours.

The main components of the Health Service include the Student Health Clinic in the Marshall I. Pickens Rehabilitation Center, located at the corner of Trent Street and Erwin Road, and the infirmary on the East Campus. For treatment of most illnesses or injuries, students should first contact the Student Health Clinic. Transportation may be made via the campus bus, or emergency transportation can be obtained from the Duke Campus Police or the Durham Ambulance Service.

The facilities of the Student Health Service Clinic are available during both regular and summer sessions to all currently enrolled full-time students attending classes at Duke. The facilities of the University Infirmary are available during the regular sessions only from the opening of the University in the fall until Graduation Day in the spring.

The resources of the Duke University Medical Center are available to all the Duke students and their spouses and children. Charges for any and all services received from the Medical Center are the responsibility of the student as are the charges for services received from physicians and hospitals not associated with Duke University.

For emergency problems when the Student Health Clinic is not open, the emergency room at Duke University Medical Center is available. The financial responsibility for expenses incurred in the emergency room rests with students or their parents.

In addition to the Student Health Service, the University makes available a plan of accident and sickness insurance to cover all full-time students who are enrolled in the University. This plan is designed to complement services normally not accessible to students through the Student Health Service coverage; it covers students both on and off campus, at home, or while traveling between home and

school during the interim vacation periods throughout the one-year term of the policy.

The Student Health Program does not provide health care for spouses and dependent children of married students. There are provisions in the insurance plan, however, for coverage of the married student's family. Preexisting conditions of dependent spouse and/or children are not covered.

The Duke Student Accident and Sickness Policy. The Duke Student Accident and Sickness Insurance Policy is available at a reasonable charge. The supplemental coverage provides coverage for hospitalization and major medical expenses. The policy is more fully described in a brochure sent through the bursar's office.

Vacations and Free Quarters. All students should take note that the Student Health Service does not provide care during quarters for which fees and tuition are not being paid.

The supplemental health insurance plan is designed to complement services normally available through the University Student Health Service in order that students may be protected at times when the service does not apply and for accidents and illnesses which it does not cover. This plan provides protection twenty-four hours per day during the full twelve-month term of the policy for each student insured. Students are covered on and off the campus, at home, while traveling between home and school, and during interim vacation periods.

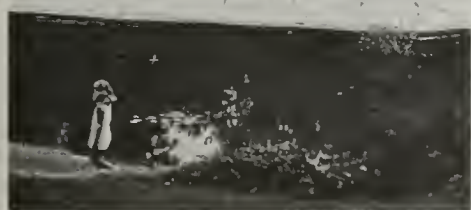
Information concerning the availability of additional health care may be obtained from the Student Health Service. These rules and regulations are those in effect at the time of publication of this bulletin, but are subject to change at a later date.

All full-time and part-time degree candidate students are required to enroll in the Student Accident and Sickness Insurance Policy unless they show evidence by completing the appropriate waiver statement contained on the remittance form of the University invoice indicating that they are covered by other generally comparable insurance. This statement requires that the name of the insurance company and the policy number be indicated as well as the signature of the student or parent. Also, note this requirement may be waived by signing the appropriate space on the University invoice indicating willingness to assume the medical costs of any sickness or accident.

Counseling and Psychological Services. Counseling and Psychological Services (CAPS) is located in Suite 214, Old Chemistry Building, on West Campus next to the Medical School. Services are available to all undergraduate, graduate, and professional students enrolled at Duke University. CAPS provides a coordinated and comprehensive range of services including evaluation and counseling regarding personal problems relating to family, social, academic, vocational, and sexual matters; psychological testing encompassing educational, vocational, and personality assessment; and psychotherapy for more serious psychological problems. While students' visits with counselors are usually by appointment, a walk-in consultation service is provided two hours each weekday for students with urgent personal concerns.

Each year CAPS offers a series of self-development seminars focusing on skills development and special interests. These explore such interests as stress-management, assertiveness training, career planning, couple's communication, and study skills. Interested students may contact CAPS for further information.

The professional staff is composed of clinical social workers, psychiatrists, and clinical and counseling psychologists who are experienced in working with young adults. When a student and a staff member have evaluated the student's concern, then individual sessions, joint sessions with couples, and/or group counseling and psychotherapy may be recommended to help the student resolve the concern. CAPS maintains a policy of *strict confidentiality* about each student's



contact with the CAPS staff. Such information can be released, however, upon the student's specific written authorization.

Initial evaluation and brief counseling/psychotherapy, as well as skills development seminars, are covered by payment of the student health fee. There are no additional costs for these services. If appropriate, a referral may be made to other staff members or to a variety of local resources including multidisciplinary mental health professionals in private practice and clinic settings.

Appointments may be made by telephone or at the CAPS office. Office hours are Monday through Friday between 8 A.M. and 5 P.M. If a student's concern needs immediate attention, it should be indicated by the student and every effort will be made for a counselor to talk with the student at the earliest possible time.

Additionally, standardized testing is administered for the University community by CAPS. These include the Graduate Record Examination (GRE), Medical College Admission Test (MCAT), Law School Admission Test (LSAT), and Graduate Management Admission Test (GMAT). CAPS also maintains a library of a wide selection of vocational and educational program resource materials to assist students in choosing a career and/or further training programs in graduate or professional study.

Another important function of CAPS is the availability of the staff to the entire University community for consultation and participation in educational activities regarding student development and general mental health issues. The staff works with other campus personnel including administrators, faculty, the Student Health Service, Religious Life Staff, Residential Advisers, Office of Placement Services Staff, and student groups such as Freshman Advisory Counselors, PISCES, and Project Wild in meeting whatever student needs are identified through such liaisons.

Student and Professional Organizations

Alpha Omega Alpha. Alpha Omega Alpha Honorary Medical Fraternity was organized nationally in 1902 and the Duke Chapter (North Carolina Alpha) was chartered in 1931. The aims of this society are the promotion of scholarship and research in medical schools, the encouragement of high standards of character and conduct among students and graduates, and the recognition of high attainment in medical science, practice, and related fields. Students who have demonstrated leadership and academic promise of future achievement are elected. Membership is limited to no more than one sixth of any class and of these as many as one half may be elected in the junior year. Honorary membership in the fraternity, as well as honorary alumni and faculty membership, may also be conferred upon certain physicians who have distinguished themselves in the various areas of medical teaching, research, and practice.

Davison Society. All medical students are dues-paying members of the Davison Society which is governed by elected officers and class representatives comprising the Davison Council. The Davison Council functions as the official representative body for Duke medical students and as such nominates or elects students to serve on all appropriate Medical Center and University committees including: MedSAC, MEPAC, Admissions, Curriculum, Judiciary, Dean's Hour, Faculty-Chairman Search, Library, Human Experimentation, and several other committees.

Currently subcommittees of the council are looking at the issues of curriculum evaluation; primary care at the Medical Center and in medical education at Duke; and communication to all students of the opportunities available for study away from the University such as externships and residencies.

Student representatives are appointed by the Davison Council to attend the annual meetings of the American Medical Student Association, North Carolina



Medical Society, American Medical Association, Association of American Medical Colleges, the Southern Medical Association, and other meetings of importance to medical students. Students have been sponsored to attend the Congress on Medical Education, the AMA Congress on Medical Ethics, American Women's Medical Association, and the Student National Medical Association annual meetings.

Publications of the Davison Society include a weekly newsletter, *Shifting Dullness*, and a student directory. Socially, the society sponsors beer and pizza dinners with faculty and administrators, class parties, a spring picnic, a fall dance, the annual spring Medical School Show, and a round-robin tennis tournament with the faculty.

Other medical student groups recognized by, and in part funded by, the Davison Society include the American Medical Student Association, the American Medical Women's Association, the Student National Medical Association, the Sex Education Committee (which runs an elective course for nursing and medical students, an evening course for undergraduates, and gives courses in the local junior high schools), and the East End Clinic (a free clinic run by medical, nursing, pharmacy, and other students from Duke and the University of North Carolina, Chapel Hill).

The Honor Code is also authorized and administered by the Davison Society.

The Engel Society. The Engel Society, established in 1966 as a memorial to Professor Frank L. Engel, is designed to promote intellectual and social interaction between students and faculty. Membership is limited to six junior students and six senior students who have demonstrated an inquisitive nature, humanitarian interests, and high scholastic ability. Four faculty members are selected annually by members of the society for three year terms. Six dinner meetings with guest speakers are held each year. Other students may be invited to participate.

Ganglion Society. The Ganglion Society (the Duke neuroscience society) seeks to promote interest in the neurosciences and to facilitate communication among individuals studying and working in this multidisciplinary field. To accomplish this, the society publishes *The Neurotransmitter*, a weekly bulletin of local events in the basic and clinical neurosciences. It also sponsors informal evening discussion sessions featuring visiting scientists and clinicians prominent in one or more areas of the neurosciences. Membership and participation in these activities is open to anyone with an interest in the neurosciences.

Duke University Medical Alumni Association. The Duke Medical Alumni Association consists of nearly 6,000 members including all graduates of the Medical School, past and present faculty, and all past and present house officers of Duke Hospital. A magazine is sent to all members three times annually. November reunions are held each year in Durham. Alumni groups meet in several states and meetings are held in conjunction with the meetings of the American Medical Association, the American College of Physicians, the Southern Medical Association, the North Carolina Medical Society, and several departmental specialty society meetings.

Officers. President: Emile L. Gebel, M.D. 1962, Shelby, North Carolina; Secretary-Treasurer: Jay M. Arena, M.D., 1932, Durham, North Carolina; R. C. "Bucky" Waters, Assistant Vice-President for Health Affairs-Development and Alumni; Janet Sanfilippo, Director, Medical Alumni Affairs.

Awards and Prizes

Davison Scholarship. The Davison Scholarship award, consisting of \$1,000, was formerly donated by the late Dean Wilburt C. Davison. The award is now supported by the Davison Club in the memory of Dean Davison and is awarded to enable a medical student to participate in a clinical science elective outside the United States preferably in an area of primary care. Any student may apply for the award. For consideration for the scholarship, the elective must be approved by the Study Away Committee.

Thomas Jefferson Award. This award, consisting of \$100, a certificate, and a book recognizes a graduating senior student who has made outstanding contributions to the University or to fields which have not been traditionally confined to science and medicine. The award is given by the Awards Committee.

Lange Medical Publications Awards. Two seniors selected by the Awards Committee for excellence in academic and service work are awarded four books published by the Lange Medical Publications. The books are selected by individual recipients.

The Joseph Eldridge Markee Memorial Award in Anatomy. This award, donated by the friends and family of the late Dr. J. E. Markee, James B. Duke Professor of Anatomy and Chairman of the Department of Anatomy from 1943 to 1966, consists of a certificate, medallion, and cash award of \$200. It is presented by the Department of Anatomy to the most outstanding student in anatomy during the first year in the Medical School.

C. V. Mosby Book Award. Four graduating senior students are selected by the Awards Committee for active participation in service to the students, community, and medical school. The award is a Mosby book not to exceed \$30.

Trent Prize. An annual award of \$100 is given to a Duke medical student for the best essay on any topic in the history of medicine and allied sciences. Mary Trent Semans established this award in memory of the late Josiah C. Trent to encourage students to undertake independent work in the history of medicine and to utilize the resources of the Trent Collection.

Upjohn Award. The award consists of \$200 cash and a certificate and is presented to a Duke graduating senior for excellence in community health science projects and service to the community.

Sandoz Award. This award is given to a senior student who has done distinguished work in basic science research or clinical research. Students will be nominated for this award by departmental Chairmen with whom their work has been done. The work must have been presented at the AOA symposium and voted upon by the Awards Committee. It consists of a plaque and a check for \$100 and is limited to one student.

Ciba Award. This award is given to a student who has contributed to the health care of the community. Students are nominated by the student body and voted upon by them. The award consists of the complete set of medical illustrations and text by Frank Netter.

Other Awards. Throughout the year, Duke Medical School receives notification of awards consisting of books, money, and/or plaques or medals to be awarded to students in a variety of fields at all medical schools on a national competitive basis selected by committees of the sponsoring organizations. These awards are screened by the Assistant Dean for Student Affairs who announces awards which are of interest to the Duke medical students. Since these are national competitions, they vary from year to year.

Admission



Admission Procedures

Good study habits, intelligence, character, and integrity are essential qualifications for admission. Beyond this, premedical students should strive for an education that develops abilities to observe critically, think analytically, and work independently. Though a knowledge of basic scientific principles should be secured, the competence with which premedical students conduct their undergraduate careers is of more importance than the specific subjects which they study.

Application for Admission. Application forms for the Duke University School of Medicine may be obtained by writing the Committee on Admissions, Box 3710, Duke University Medical Center, Durham, North Carolina 27710. Prior to 1 April, all requests for application materials will be assigned to a mailing list. The materials will be forwarded during the first week in April; applications will be accepted between 1 June and 1 November. The deadline for receipt of application requests is 6 October, and the deadline for receipt of applications is 1 November.

Requirements. Admission to the School of Medicine requires a minimum of ninety hours of approved college credit including one year of college English (consisting primarily of expository English composition), one year of inorganic chemistry, one year of organic chemistry, one year of physics, one year of biology and/or zoology, and one year of calculus. Embryology and physical chemistry are strongly recommended but not required. An introductory course in biochemistry during the senior year would be helpful. All science requirements must be completed not more than seven years prior to entrance.

The New Medical College Admission Test, administered by the American College Testing Programs and Services, P.O. Box 414, Iowa City, Iowa 52240, is required of all applicants. This test is given in April and September of each year at numerous colleges throughout the United States. Students should consult their premedical advisers and arrange to take this test in April of the year they plan to submit applications for admission.

Selection

The earliest date of notification of acceptance is 15 October for students entering the following August. Data on each candidate are carefully evaluated by the Committee on Admissions. If the distance is not too great, a personal interview will be conducted at Duke for those students with satisfactory credentials. Other candidates will be referred for personal interviews with regional representatives of the Admissions Committee. Those candidates who demonstrate the most promise



for exceptional performance in their future practice of medicine are admitted on the basis of merit and are notified as soon as possible whether or not they have been accepted. In order to ensure enrollment, accepted candidates must return a signed agreement and a \$50 deposit within three weeks after notification. Since admission is offered a considerable period in advance of matriculation, it is provisional upon the successful completion of remaining required premedical college courses.

Transfer

Applicants who have completed the basic sciences in other medical schools will be considered for transfer only as space permits. Such transfer students are required to complete the second and fourth years of the Duke curriculum.

Performance of Part I of the National Board Examination or MSKP is a requirement for transfer applicants. Duke does not sponsor applicants to take the National Board Examination, although the scores must be received as part of the evaluation procedure.

The policy governing tuition for transfer students is that they will pay the same tuition in their initial year and all subsequent years as the class with which they enter.

Requests for application materials are accepted after 15 November. 1 March is the deadline date for the receipt of applications. Personal interviews will be

arranged for those with satisfactory credentials. Transfers into the freshman or senior year are not permitted.

Advanced Placement

Advanced placement is offered to qualified first-year students on an optional basis for the following first semester courses: anatomy, biochemistry, genetics, and physiology. Students desiring consideration for advanced placement are required to take examinations in applicable subjects during the first week of medical school. Those who are granted and accept advanced placement for a specific course are not required to enroll in that course but will be responsible for arranging mutually satisfactory substitutions with the appropriate department Chairman.

Students who have been awarded Ph.D. degrees in biomedical or preclinical sciences may apply for a three-year program to obtain their M.D. degrees. This program consists of the regular core basic science courses required of all freshman medical students, core clinical rotations during the second year, followed by senior clinical electives.

Reapplication

Students who wish to apply for a second time should write to the Medical School Admissions Office requesting new application forms. Supporting documents will be transferred to the new application file. These documents will be kept on file for three years.

Summary

Three years of college work, forty-five dollars (\$45) nonrefundable application fee, fifty dollar (\$50) deposit within three weeks of notification of acceptance, and the New Medical College Admission Test are required. The number of students in the 1983-84 freshman class is 114.



Application requests are accepted from 1 April to 7 October. Applications for admission must be received between 1 June and 1 November 1983. Students will be notified beginning 15 October 1983. Orientation begins 17 August 1984.

Roster of Regional Representatives of Admissions Committee

Alabama:	Birmingham, Ben V. Branscomb; Tuskegee, Alexander W. Boone, Jr.
Alaska:	Anchor Point, Milo H. Fritz; Sitka, J. Paul Lunas
Arizona:	Phoenix, Robert H. Barnes; Scottsdale, Boyd H. Metcalf
Arkansas:	Little Rock, Rosalind Smith Abernathy, E. Clinton Texter, Jr.
Belgium:	Liege, Emile F. LeClercq
California:	Anaheim, George Hayter; Bakersfield, Victor S. Constantine; Berkeley, H. I. Harvey; Beverly Hills, Ben Kohn; Burlingame, J. M. Javer, Lester H. Margolis, Andrew Nadell; Fontana, Henry L. Burks; Hayward, William New, Jr.; Irvine, A. Brian Davis; Los Angeles, Earl W. Brian, Walter Lusk, Kenneth P. Ramming, Douglas F. Smiley; Menlo Park, Gustave Freeman; Oceanside, Barry B. Campbell; Palo Alto, James B. Golden, John B. Simpson; Redlands, Perry Dyke; Riverside, James S. Mayson; Sacramento, Irving E. Allen; San Diego, Donald J. Williams; San Francisco, Gert Brieger, Philip G. Hoffman, David W. Martin, Jr., R. Gray Patton; Santa Barbara, John A. Baumann; Woodland Hills, Andrew A. Bonin
Canada:	Montreal, J. E. Gibbons; Toronto, John B. Armstrong, J. Stonewall Dorsey
Colorado:	Denver, John Ray Pryor, Fred W. Schoonmaker
Connecticut:	Greenwich, Milton F. Campbell; Hartford, William H. Glass; Mystic, Henry B. Freye; New Haven, Saul A. Frankel, Ned M. Shutkin
District of Columbia:	Washington, Linda E. Green
England:	Bentwaters, John P. Tindall
Florida:	Deerfield Beach, Eugene L. Horger; Jacksonville, J. David Cahill; Miami, Stanley J. Cannon, James J. Hutson, Leonard A. Kalman; St. Petersburg, David S. Hubbell; Tampa, Richard G. Connor
Georgia:	Albany, Havner H. Parish, Jr.; Atlanta, Crawford F. Barnett, Jr.; Decatur, William W. Blackburn
Hawaii:	Kailua, Stanley Karansky; Honolulu, James G. Harrison
Idaho:	Idaho Falls, Reid H. Anderson
Illinois:	Barrington, George Pepper; Chicago, John H. Buehler, Ruth K. Freinkel, George H. Gardner, Daniel J. Pachman, Joe L. Simpson, John D. Utley; Des Plaines, Earl N. Solon; Evanston, Donald R. Mundie, Milton Weinberg, Jr.; Geneva, Charles A. Hanson; Monmouth, Kenneth E. Ambrose
Indiana:	Angola, Norman W. Rausch; Indianapolis, Mark O. Farber, John D. Graham; Munster, John A. Nadas
Kansas:	Emporia, Gould C. Garcia; Salina, Roy B. Coffey
Kentucky:	Lexington, Kearns R. Thompson; Louisville, Billy Franklin Andrews, George Uhde
Louisiana:	New Orleans, Nancy Haslett, James A. Knight, Richard M. Paddison, George Porter, Virginia Porter
Maine:	Portland, E. Charles Kunkle
Maryland:	Baltimore, C. Edward Leach; Mt. Rainier, Linda D. Green; Olney, Joseph Buffington; Towson, William C. Battle
Massachusetts:	Arlington, Katherine S. Upchurch; Boston, R. Wayne Alexander, G. P. Beard-sley, Herbert W. Clegg III, Ann W. Crosson, Richard J. Kopelman, John Modlin, Britain Nicholson, Ellison C. Pierce, Jr, Stephen Sohn; Brockton, Philip A. Hourigan, Jr.; Brookline, Bernard Levy; Cambridge, Paul N. Chervin; Hyannis, Linda A. Bishop; Springfield, George A. Sotirion; Worcester, Michael S. Ent-macher
Michigan:	Ann Arbor, George E. Bacon, Donald L. Rucknagel, Joann A. P. Wilson; East Lansing, Norbert Enzer; Grosse Pointe, John M. Lesesne
Minnesota:	Fairmont, Lawrence T. Donovan; Minneapolis, Lewis W. Wannamaker; Rochester, William M. O'Fallon; St. Paul, John J. Fath
Missouri:	Bridgeton, Thomas J. Banton, Jr; Creve Couer, Roman L. Patrick; Springfield, Norman C. Shealy; St. Louis, W. Edwin Dodson, Thomas B. Ferguson, James R. Gavin III
Nebraska:	Omaha, Gayle H. Bickers, Helen Starke
New Hampshire:	Exeter, Eric D. Lister; Grantham, William T. Davison; Hanover, George Margolis, R. J. Vanderlinde
New Jersey:	Kendall Park, Brian G. Zack; Livingston, Stephen J. Victor; Morristown, Philip K. Keats; New Brunswick, Bernard A. Rineberg; Paterson, Linda F. Rankin;

- Piscataway*, William E. McGough; *Pompton Plains*, Charles W. Ross; *Summit*, Wayne S. Barber; *Watchung*, R. Christopher Stucky; *Woodcliff Lake*, Steven P. Honickman
- New Mexico: *Artesia*, C. Pardue Bunch
- New York: *Endicott*, Vincent Giordano; *Ithaca*, John G. Maines; *Lawrence*, Stephen M. Lazarus; *New York*, Joan S. Adams, Michael Brownlee, Carl H. Fromer, William A. Gay, Jr., David S. Goldman, Kenneth G. Gould, Eddie L. Hoover, Bruce Horten, Lenard Jacobson, Roy B. Jones, Seymour R. Kaplan, Michael J. Lepore, Phyllis C. Leppert, Leonard H. Schuyler, Mona M. Shangold, Robert A. Shimm, David N. Silvers, Nathan St. Amand, Melvin L. Thrash; *Pittsford*, Rufus S. Bynum; *Rochester*, Marvin S. Amstey, David N. Broadbent; *Syracuse*, Herbert Lourie, L. Stewart Massad, James E. Sheehy; *West Point*, Walton Curl; *White Plains*, Harvey J. Cohen
- North Dakota: *Bismarck*, Robert B. Tudor
- Ohio: *Cincinnati*, Murray B. Sheldon, Jr.; *Cleveland Heights*, Robert B. Kubek; *Columbus*, Robert J. Atwell, Charles A. Doan, David S. Forth, Lucy R. Freedy, George W. Paulson, James V. Warren; *Elyria*, William L. Hassler; *Toledo*, George F. Alter
- Oklahoma: *Muskogee*, Robert H. Gibbs
- Oregon: *Eugene*, Paul W. Jones; *Portland*, Joseph F. Paquet
- Pennsylvania: *Bethlehem*, Ralph K. Shields, James G. Whildin; *Bristol*, Dianne M. Quinn; *Bryn Mawr*, John V. Blady; *Camp Hill*, Alfred J. Sherman; *Doylestown*, Zachary A. Simpson; *Dunmore*, Louis C. Waller; *Harrisburg*, Earl S. Moyer; *Johnstown*, W. Frederick Mayer; *Haverford*, Mildred H. LaFontaine; *Lancaster*, Richard D. Gentzler; *Philadelphia*, Max W. Fischbach, Mary Ann Forciea, John J. Furth, David M. Goodner, James R. Harp, Richard I. Katz, Sheila M. Katz, Graham E. Quinn, Jack D. Myers; *Wynne Wood*, Frank Kern
- Puerto Rico: *Sanurce*, Rafael Hernandez-Saldana
- Rhode Island: *Lincoln*, Henry G. Magendantz; *Providence*, Benjamin T. Jackson, Richard P. Sexton
- South Carolina: *Charleston*, Edward Frost Parker; *Columbia*, Collin F. Baker, Ben N. Miller, James M. Timmons; *Greenville*, Raymond C. Ramage
- Tennessee: *Chattanooga*, Richard Van Fletcher; *Knoxville*, Alan Solomon; *Memphis*, Peter D. Jones; *Nashville*, Walter G. Gobbel, Jr., Alexander C. McLeod, Greer Ricketson
- Texas: *Austin*, Frank A. Morris, Jr.; *Dallas*, Reuben H. Adams, W. Crockett Cheers, Jr., William Shapiro; *Houston*, Elizabeth B. Powell, Peter T. Scardino, H. Grant Taylor; *Midland*, Dorothy B. Wyvell
- Utah: *Salt Lake City*, N. Branson Call, Andrew Deiss
- Vermont: *Burlington*, Edward S. Horton
- Virginia: *Richmond*, R. Lewis Wright; *Virginia Beach*, Ruth Capp; *Waynesboro*, Thomas L. Gorsuch
- Washington: *Bellevue*, David T. Pitkethly; *Bothell*, Ronald C. Reed; *Longview*, Clifford J. Schostal; *Renton*, Wallace H. J. Chang; *Seattle*, Gregory J. Raugi; *Spokane*, Charles L. Dorsey
- West Virginia: *Wheeling*, David P. Hill
- Wisconsin: *Milwaukee*, Jack L. Teasley
- Wyoming: *Sheridan*, James L. Scott; *Teton Village*, John A. Feagin

Financial Information



Fees and Expenses

Tuition. The following table represents an estimate of a student's necessary expenses in the School of Medicine. The total of these figures suggests a basic minimum budget of approximately \$13,000. These are estimated figures only and are based on a 1978 survey of enrolled students. Tuition and fees are subject to change without notice. Allowances for recreation, travel, clothing, and other miscellaneous items must be added to this estimate with allowances for individual needs and tastes.

Tuition	\$8,500.00
Accident and Sickness Insurance (subject to change)	130.00
Instruments* (first year only)	425.00
Laboratory Fee (includes microscope rental, first year only)*	175.00
Laboratory Coats	60.00
Annual Cost of Books: first year	488.00
Annual Cost of Books: second year	324.00
Annual Cost of Books: third and fourth year	163.00
Lodging	2,078.00
Board (University Dining Halls): first and second year	1,927.00
Board (University Dining Halls): third and fourth year	1,734.00
Student Health Service†	230.00
Student Government (Davison Society)†	15.00
Motor Vehicle Registration	20.00

*Sphygmomanometer, ophthalmoscope, otoscope, and other equipment required of each student must conform to rigid standards.

†Mandatory fee. For details, please refer to Student Health Service.

Tuition and fees are payable on a term basis and all students are required to pay full tuition for four years as a requirement for graduation. For the freshman year one-half of the annual tuition and fees is due on the Monday on which classes begin in August and the other one-half is due on the Monday preceding the beginning of classes in January. Full tuition will be paid for enrollment in 60 percent or more of the required first year courses while prorated tuition will be paid for enrollment in less than 60 percent of those courses. Sophomores, juniors, and seniors pay tuition and fees by the Monday preceding the beginning of classes in each term. Second year students are billed at the rate of one-sixth of the annual tuition and fees for each clinical rotation for which they are registered. Juniors and seniors are billed in accordance with the number of elective credits for which they

are registered. The cost per credit equals the annual tuition divided by the number of credits required per year.

Payment of Bursar Accounts for Fall and Spring. Monthly invoices for tuition, fees, and other charges will be sent by the Bursar's office and are payable by the invoice due date; no deferred payment plans are available. As a part of the agreement of admission to Duke University a student is required to pay all invoices as presented. If full payment is not received, a late payment charge as described below will be assessed on the next invoice and also certain restrictions as stated below will be applied.

Late Payment Charge. If payment in the amount of the total amount due on the student invoice is not received by the invoice due date, a penalty charge will be accrued from the billing date of the invoice. The penalty charge will be at a rate of $1\frac{1}{3}$ percent per month (16 percent per annum) applied to the past due balance on the student invoice. The past due balance is defined as the previous balance less any payments and credits received during the current month and also any student loan memo credits, related to the previous balance, which appear on the invoice.

Restrictions. An individual will be in default of this agreement if the total amount due on the student invoice is not paid in full by the invoice due date. An individual who is in default will not be allowed to register for classes, receive a transcript of academic records, have academic credits certified, be granted a leave of absence, or receive a diploma at graduation. In addition, an individual in default may be subject to withdrawal from school.

No credit will be given for any term in which the tuition has not been paid, whether the work has been at Duke or elsewhere. Nonreceipt of a bill does not exonerate the student from payment or from assessment of late fees. It is not advisable for students to attempt outside work to defray their expenses during the academic year. Spouses of medical students desiring employment may secure information from the Duke University Personnel Office.

Fall and Spring Refunds. Tuition and fees refunds are governed by the following policy:

1. In the event of death a full tuition and fees refund will be granted.
2. In all other cases of withdrawal, students or their parents may elect to have tuition refunded or carried forward as a credit for later study according to the following schedule:
 - a. withdrawal before the beginning of classes—full refund;
 - b. withdrawal during the first or second week—80 percent;
 - c. withdrawal during the third through fifth week—60 percent;
 - d. withdrawal during the sixth week—20 percent;
 - e. withdrawal after the six week—no refund;
 - f. tuition charges paid from grants or loans will be restored to those funds on the same prorata basis and will not be refunded or carried forward.
3. In the case of changing category from full-time to part-time, dropping special fee courses (music, art, golf, etc.), or dropping audit courses, a full refund will be granted during the drop/add period. Subsequent to the drop/add period changes of category will not be allowed. Students may, however, withdraw from courses after the drop/add period with no refund or add new courses if the proper tuition is paid.

Living Accommodations

Housing Fees. For the academic year, 1982–83 the first-year medical student residential fee for Town House Apartments was \$2,162 and \$1,903 for Duke Modular Homes. These fees are per person for the academic year. Utility charges are not included in these fees. Cost of the utilities, except water, will be shared by occupants in these apartments.

Housing fees will be adjusted upward for the 1983–84 academic year. A \$50 deposit is required with all applications.

Rates for Central Campus Apartments will be quoted to applying students upon request to the Housing Administration Office. Refunds on housing fees will be made in accordance with the University's established schedules.

Dining Facilities. Duke University Food Services provides well-balanced, nutritious meals for students in a number of food plans. Meal plans ranging from \$366 to \$1,734 allow students to eat in board plan or a la carte operations. Whether relaxing in the restaurant setting of the Oak Room or watching wide screen TV while enjoying a deli sandwich, quality and service are foremost.

Motor Vehicle Registration

Each motor vehicle operated on Duke University campuses by students enrolled in the School of Medicine must be registered at the Medical Center Traffic Office, PRT Level, Parking Deck II, within five days after operation on the campus begins, and thereafter must display the proper registration decal.

All students must pay an annual fee of \$20 for each four-wheeled motor vehicle and \$10 for each motorbike or motor scooter registered. Bicycles are registered free of charge at the Public Safety Department, 2010 Campus Drive.

To register a vehicle, the student must present a valid state registration for each vehicle registered and a valid state operator's license.

Parking, traffic, and safety regulations will be given each student at the time of registration of the vehicle(s). Students are expected to abide by these regulations.

Financial Aid

The Duke University School of Medicine makes financial assistance available to accepted students who, due to economic circumstances, could not otherwise attend the University. The school recognizes, however, the responsibility of the individual and the family to provide funds to achieve the objective of a medical education. Thus, the school does not consider that parents have discharged the full financial obligation for the continuing education of their sons or daughters upon the latter's completion of the undergraduate degree.

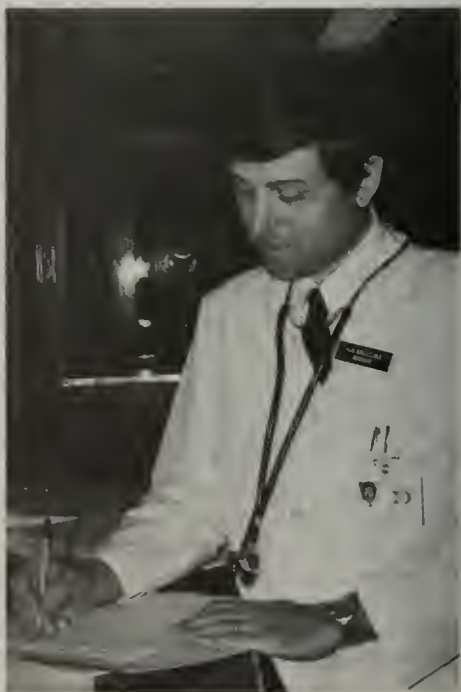
Financial assistance is available in a combined form of scholarships and loans, and all awards are made on the basis of demonstrated need; however, the School of Medicine can no longer guarantee that funds will be available for every student who documents financial need.

Financial Assistance to Incoming Freshmen. When the medical school applicant receives a letter of acceptance into Duke University School of Medicine, a financial aid application is included if the student has indicated an interest in assistance on the application for admission. The economic circumstances of the applicant have no bearing on whether the applicant is accepted into the Medical School.

The student requesting financial aid is expected to work during the summer preceding entrance into medical school and to save part of these earnings to defray a portion of the first-year expenses.

The student's need must be established before an award can be made. The Office of Financial Aid, therefore, requires the Duke University application for financial aid and computation from the GAPS FAS form. Copies of federal income tax returns and a financial aid transcript are required as part of the financial aid application.

The present financial aid package, which is subject to change, is based on a \$5,000 federal (or state) insured student loan. Financial need in excess of \$5,000 comes from one-half school gift and one-half from school loan.



Financial Assistance to Upperclassmen. Annual reapplication is required of all scholarship and loan recipients. Upperclassmen seeking financial assistance for the first time should consult with the Coordinator of Financial Aid.

Endowed Funds.

Germain Bernard Scholarship, established in 1959 by the B. C. Remedy Company.

Thomas C. Bost Scholarship, established in 1965 by a gift from Dr. Thomas C. Bost, supplemented by subsequent gifts.

James L. Clark Memorial Scholarship, established in 1965 by a gift from Mr. and Mrs. Marvin D. Clark and supplemented by gifts from other donors.

C. T. Council Scholarship, established in 1959 by the B. C. Remedy Company.

John H. Dorminy Scholarship, established in 1980 by gift from John H. Dorminy, Jr.

Eagles-Andrews Memorial Scholarship, established in 1982 by a gift from Dr. and Mrs. William M. Eagles.

William F. Franck Memorial Scholarship, established in 1958 by gift from William F. Franck, Jr. '39, and supplemented by additional gifts.

Joseph W. Greer Scholarship, established in 1980 by gift from Mr. and Mrs. Joseph H. Greer.

Warren W. Hobbie Fund, established in 1980 by trustees of the Warren W. Hobbie Charitable Trust.

George Lee Hundley and Rebecca Barnhill Hundley Fund, established in 1980 by gift from George Lee and Rebecca Barnhill Hundley.

H. B. and Adelaide F. Ingle Medical Scholarship, established in 1976 by gift from Mr. and Mrs. Harry B. Ingle.

B. Everett Jordan Scholarship, established in 1974 by the late Senator B. Everett Jordan and his widow, Katherine Jordan.

Thomas D. Kinney, M.D. Memorial Scholarship, established in 1980 by gifts from his widow, Dr. Eleanor R. Kinney, and their children: Thomas R. Kinney, M.D.; Eleanor D. Kinney; J.D., Hannah C. Kinney, M.D.; and Janet S. Kinney, M.D.

Dr. John Haden Lane Memorial Scholarship, established in 1968 by gift from Edward H. Lane Foundation.

E. C. Langston Medical Scholarship, established in 1979 by bequest of Mrs. Denzil L. Mosteller.

Paul E. Leviton Medical Scholarship, established in 1981 from the estate of Paul E. Leviton.

James Cecil McGehee Memorial Medical Scholarship, established in 1975 by gift from C. G. McGehee, Jr.

Medical Alumni Scholarship, established in 1974 by Duke Medical Alumni.

Medical Class of 1950, established in 1980 by gifts from graduates of 1950.

Medical Class of 1981 and AESCULAPIAN/80 Staff, established in 1980.

Medical School Faculty Wives Scholarship, established in 1968 by a gift from the Medical School faculty wives whose source of funds is proceeds from the Nearly New Shoppe.

Physical Medicine Scholarship, established in 1963 by gift from Central Carolina Convalescent Hospital, Inc., Greensboro, North Carolina.

Radiological Science Medical Student Loan Fund, established in 1980 by the Department of Radiology.

Senior Class Gift, established by graduates of classes of 1977 and 1978.

Melvin D. and Judith N. Small Medical School Scholarship Fund was established in 1976 by gift from Dr. Melvin D. and Mrs. Judith N. Small.

Sigmund Sternberger Endowment Fund, established in 1978 by gift from the Sigmund Sternberger Foundation, Inc., Greensboro, North Carolina.

B. W. Stiles Scholarship, established in 1981 by gift from the Mary Duke Biddle Foundation.

Francis and Elizabeth Swett Scholarship, established in 1966 by gift from the late Dr. and Mrs. Swett.

Dr. Hillory M. Wilder Memorial Scholarship, established in 1962 by bequest from Celeste Wilder Blake and Kenneth M. Blake.

Sue Eggleston Woodward Memorial Scholarship, established in 1966 by gifts from parents, relatives, and friends.

Vivian Zirkle Memorial Scholarship, established in 1981 by gift from Drs. Lewis and Sara Zirkle.

Other Medical School Scholarships. Mary Duke Biddle Scholarships, Duke Hospital Medical Auxiliary Scholarships, Dr. E. Eugene Owen Scholarship, Duke University School of Medicine Scholarships, State of North Carolina (tuition remission up to \$2,000), and Slane Family Scholarship.

Federal Scholarships. Armed Forces (Army, Navy, and Air Force) Scholarship programs are available for accepted or enrolled students. The recipient receives full tuition, fees, and living allowance in return for a commitment of service as a physician for each year of funding. The special application is made directly to the program in which the student is interested.

First-Year Scholarships for Students of Exceptional Financial Need. This federally funded program pays tuition, fees, and living expense. The student must have zero family resources as measured by a nationally recognized needs analysis. Recipients are selected by the school using federal criteria. For 1982-83 there was one scholarship.

North Carolina Board of Governors Medical Scholarships (BGMS). Each year seventeen Board of Governors Medical Scholars are chosen from among forty qualified first year medical school candidates who have been accepted for admission at one of the four medical schools located in North Carolina. BGMS recipients are selected by a statewide selection committee from candidates of all races who are financially disadvantaged state residents and who have expressed a medical interest and emphasis in practicing medicine in the State of North Carolina. BGMS awards provide a stipend of \$4,000 a year plus tuition and mandatory fees. They are renewable under certain conditions. Information about the BGMS program is available at the financial aid office.

Loans

University loans are available under the specific restrictions of the loan funds and are awarded on the basis of financial need. Some of them are: W. K. Kellogg Foundation Loan Fund, Seaborn L. Hardman Loan Fund, Medical Freshman Tuition Loan, Scott Loan Fund, Charles W. Banner Loan Fund, Robert Wood Johnson Foundation Student Aid Program, National Direct Student Loans, and U.S. Health Professions loans.

The Francis and Elizabeth Swett Loan Fund is an emergency loan available in small amounts to any medical student on a no-interest basis for a short period of time.

Federally Insured Student Loans are available to full-time financially needy students at Duke University (an approved lender) if the student is unable to locate a home-town lender.

Loans from Outside the University

North Carolina Educational Loan Program. The North Carolina Educational Loan Program is for domiciliaries of North Carolina pursuing training in certain

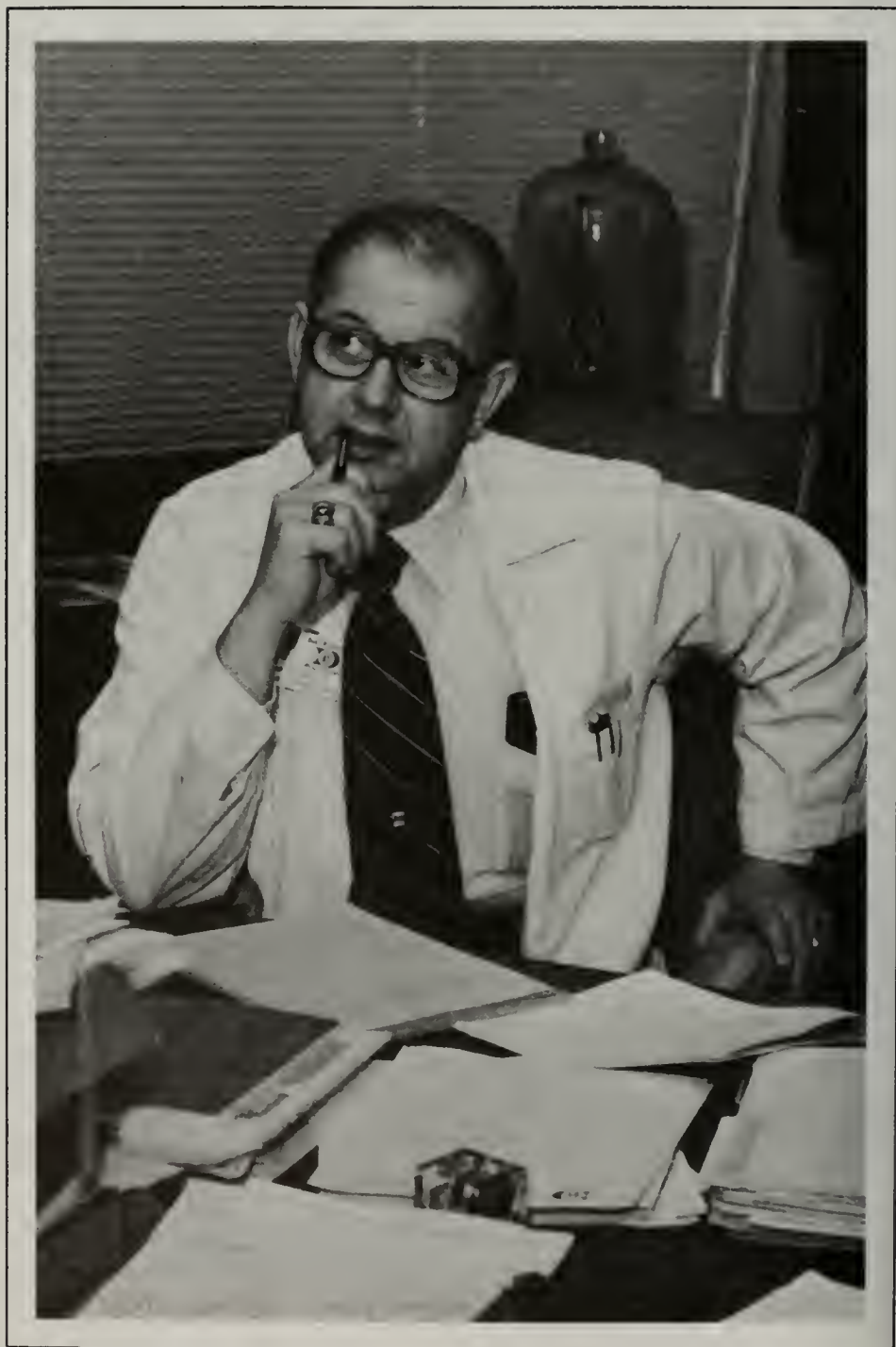
health professions who agree to practice their specialties as qualified professionals in underserved areas or programs of the state. Factors considered in awarding loans: ability to complete a training program, motivation to fulfill program goals, financial resources available to the applicant from other sources, and ability to meet domiciliary requirements. For medical students the loan is \$6,000 per year; loans are renewable depending on length of curriculum; and recipients agree to cancel their obligations by practice in shortage areas or programs of North Carolina. A personal interview is required only with the initial application and must be scheduled prior to the fall or summer for which funds are needed. For further information contact the Educational Loan Program, 116 West Jones Street, Raleigh, North Carolina 27611, (919) 733-2164.

Health Education Assistance Loans. These loans are available to accepted or enrolled students. There is an annual maximum, and interest, higher than need-based loans, is payable until repayment of principal begins. A special application is required.

Federally or State Insured (Guaranteed) Student Loans. FISL/GSL are available from many home-town banks. The annual maximum for medical students is \$5,000 with an aggregate maximum of \$25,000. Parental financial information is required and the bank may have an annual maximum less than the above figure. The 9 percent interest is federally subsidized until repayment begins six months after graduation. Previous borrowers on the insured loan program will pay 7 percent interest and have a nine-to twelve-month grace period.

Additional information, including a financial aid brochure and approved student budgets may be obtained by writing Coordinator of Financial Aid, Duke University Medical Center, Durham, North Carolina 27710.

Courses of Instruction



An asterisk placed after the course number indicates that the course is also offered in the Graduate School.

Anatomy

James B. Duke Professor: J. David Robertson, M.D. (Harvard, 1945), Ph.D. (Massachusetts Inst. of Tech., 1952), *Chairman*.

Professors: Matthew Cartmill, Ph.D. (Chicago, 1970); Sheila J. Counce, Ph.D. (Edinburgh, 1954); Harold P. Erickson, Ph.D. (Johns Hopkins, 1969); William C. Hall, Ph.D. (Duke, 1967); William L. Hylander, D.D.S. (Illinois, 1963), Ph.D. (Chicago, 1972); R. J. Reynolds Industries Professor in Medical Education Montrose J. Moses, Ph.D. (Columbia, 1949); Robert B. Nicklas, Ph.D. (Columbia, 1958); James B. Duke Professor Elwyn Simons, Ph.D. (Princeton, 1956; Oxford, 1959).

Associate Professors: Joseph M. Corless, M.D., Ph.D. (Duke, 1972); Richard F. Kay, Ph.D. (Yale, 1973); William Longley, Ph.D. (London, 1963); Michael K. Reedy, M.D. (Washington, 1962).

Assistant Professors: Frank H. Bassett III, M.D. (Louisville, 1957); Nell B. Cant, Ph.D. (Michigan, 1973); M. Joseph Costello, Ph.D. (Duke, 1971); Eric L. Effman, M.D. (Indiana, 1967); William E. Garrett, Jr., M.D., Ph.D. (Duke, 1976); Emma R. Jakoi, Ph.D. (Duke, 1973); Michael K. Lamvit, Ph.D. (Chicago, 1976); Chia-Sheng Lin, Ph.D. (Vanderbilt, 1976); Ross D. MacPhee, Ph.D. (Alberta, 1977); Richard B. Marchase, Ph.D. (Johns Hopkins, 1976); Thomas J. McIntosh, Ph.D. (Carnegie-Mellon, 1973); Patricia M. Saling, Ph.D. (Pennsylvania, 1979); Frederick H. Schachat, Ph.D. (Stanford, 1974); Kathleen K. Smith, Ph.D. (Harvard, 1980); E. Lee Tyrey, Ph.D. (Illinois, 1969).

Assistant Medical Research Professors: Hie Ping Beall, Ph.D. (Tulane, 1967); David A. Kopf, Ph.D. (Chicago, 1980); Alan D. Magid, Ph.D. (Washington, 1974); Darrell R. McCaslin, Ph.D. (Duke, 1979); Kenneth A. Taylor, Ph.D. (Berkeley, 1975).

Associates: Arthur C. Chandler, Jr., M.D. (Duke, 1959); Jane S. Richardson, M.A. (Harvard, 1966).

Lecturer: Irving T. Diamond, Ph.D. (Chicago, 1953).

Senior Research Associate: Juan A. Vergara, M.D.

Research Associates: Friderun Ankel-Simons, Ph.D.; Margaret M. Briggs, Ph.D.; H. Richard Brown, Ph.D.; Leonidas S. Cordova, M.S.; Janet A. Hall, M.S.; Gundrin Moore, Ph.D.; Patricia A. Poorman, A.M.; Mary C. Reedy, M.S.; William A. Voter, A.M.

Required Courses

During Term 1, first-year students are required to take Gross Anatomy (ANA-200), Microanatomy (ANA-201), and Neuroanatomy (ANA-202). All instruction is designed to be informal and individualized. The general principles and functional viewpoint of living anatomy are emphasized and, whenever possible, fresh tissues and living cells are used.

ANA-200. Gross Anatomy. Students dissect the entire human body except the brain. Formal classroom lectures relate structures of the human body to their developmental and phylogenetic antecedents and the clinical significance of anatomical facts. Informal lectures are presented to small groups. Filmed lectures and dissections are available to students for laboratory and library study.

ANA-201. Microanatomy. The structural organization of different tissues and organs, as determined by light and electron microscopy, is covered in lecture. Other biochemical and biophysical studies are presented to relate structure to function, especially at the cellular level. The laboratory provides practical experience with light microscopy studies and analysing on extensive collection of prepared slides.

ANA-202. Neuroanatomy. Neuroanatomy and neurophysiology are taught concurrently to correlate these fields. Patients will be presented by faculty members in clinical neurology and neurosurgery. The major portion of the course is organized by systems, e.g., sensory, visual, auditory, olfactory, and motor including cerebellar, autonomic, hypothalamic, and limbic mechanisms.

Electives

ANA-214(B). * Anatomy of the Head and Neck. This course is designed to be a review of the head and neck, emphasizing its phylogenetic and ontogenetic development along with clinically important features of the anatomy of this region. Term: Fall 1983. Weight: 2. *Smith*

ANA-217(B). * Structure and Function of Visual Photoreceptors. A detailed study of available structural, biochemical, spectroscopic, and physiological data from retinal photoreceptors. Emphasis on molecular structure of vertebrate photoreceptor membranes, effects of bleaching on rhodopsin molecules, and initiation of neural information after photon absorption. Format to combine lectures, seminars, and demonstrations. Offered alternate years. Terms: Fall 1 and 2. Weight: 3. *Corless*

ANA-221(B). * Anatomy of the Trunk. Emphasis will be on the anatomy of the thoracic, abdominal, and pelvic organs, including relationships, blood supply and innervations, and, where practical, developmental and microscopic anatomy. The dissections will be supplemented with audiovisual presentations and discussions and with such prosections as are available. Term: Spring 1. Weight: 2. *Staff*

ANA-224(B). Tutorial in Gross Anatomy. A detailed review of selected regions of the human body in the context of the core gross anatomy sequence. Student will plan, with staff, prosections, special presentations, etc. Students will elect to study one or more selected region in consultation with the staff. Terms: Fall 1 and/or 2. Weight: 1-5. *Staff*

ANA-231(B). Anatomy of Back and Extremities. Complete dissection of back and extremities, including pectoral and pelvic girdles. Visual aids will be used extensively. Course planned for orthopaedics, general practice, or neurosurgery. Terms: Spring 1 or Summer 1. Weight: 3. *Bassett and staff*

ANA-259(B). * Molecular Biology I. Protein and Membrane Structure/Function. Detailed concepts of the structure and function of proteins as enzymes and as structural elements of cellular substructures, including: protein primary structure and its determination, patterns of protein folding, mechanisms of enzyme catalysis and regulation, function and formation of multimeric protein assemblies, proteins and other constituents of biological membranes. Terms: Fall 1 and 2. Weight: 3. *Vanaman, Bell, Erickson, Rajagopalan, and J. Richardson.*

ANA-269(B). * Advanced Cell Biology. Structural and functional organization of cells and their components with emphasis on current research problems and prospects. Terms: 1 and 2. Weight: 3. *Endow and staff*

ANA-286(B). * Electron Microscopy and Related Techniques. Lectures and laboratories on methods of ultrastructure research. Fundamentals of optics; the

light microscope, phase, polarizing, and interference microscopy. Basics of electron microscopy, staining, sectioning, and replication techniques. Optical and computer image processing. Introduction to X-ray diffraction theory and apparatus in structure biological determination. Terms: Offered alternate years. Weight: 4. *Longley*

ANA-340(B).* **Tutorial in Advanced Anatomy.** Selected topics will be chosen for intensive reading and discussion. Topics may be chosen related to basic problems of cytology, growth and development, biophysics, endocrinological control, neuroanatomy, physiological differentiation and evolutionary origins of functional microsystems. Every term. Weight: 1-3 per term. *Anatomy faculty*

ANA-354(B).* **Research Techniques in Anatomy.** A preceptorial course in various research methods in anatomy including electronmicroscopy. An interested student might engage in research in physical anthropology, molecular and cell biology, developmental biology, fetal physiology, or stereotactic approaches to neuroendocrinology and neuroanatomy. Recent advances in methodology are stressed. Approval of the student by the faculty is required. Every term. Weight: 4-8. *Anatomy faculty*

ANA-411(B).* **Molecular and Cellular Bases of Development and Differentiation.** Emphasis is placed on the biochemistry of the cell surface as the basis of cell recognition, control of cell cycle, and overall tissue organization. An analysis of protein nucleic acid interactions in chromosome structure and function are considered in light of newer concepts of transcriptional and translational control. Studies also include nuclear cytoplasmic interactions as well as hormone induction of differentiation and development. The course is designed to study cellular differentiation and has been organized on a multidisciplinary level. The course is part of the lecture series of the Molecular and Cellular Basis of Differentiation Study Program. Terms: Fall 1 and 2. Weight: 3 and 4. *McCarty, Counce, Kaufman, and Padilla*

ANA-414(B). **The Human Embryo.** The first eight weeks of development are considered in detail, including fertilization, implantation, formation, and function of embryonic membranes and placenta, and establishment of major organ systems. Emphasis is placed on distinctive features of human embryogenesis, and on causes, identification, and treatment of congenital defects. Offered in alternate years. Weight: 2. *Counce and Effman*

ANA-418(B).* **Reproductive Biology.** An indepth study of male and female reproductive processes including hypothalamic, pituitary, and gonadal control mechanisms as well as the physiology of pregnancy and parturition. Lectures by guest clinical faculty will emphasize the interface between basic science and clinical aspects. The lecture material in each section of the course is followed by seminar presentations which will contribute to ANA/PHS-424, a corequisite for the course. Also listed as PHS-418(B).* Terms: Spring 1 and 2. Weight: 2. *Anderson, Schomberg, and Tyrey*

ANA-424(B).* **Reproductive Biology.** Selected topics in reproductive biology will be chosen for indepth reading and analysis in the seminar format. The seminar is to be taken as a corequisite with ANA/PHS-418(B). Also listed as PHS-424(B). Terms: Spring 1 and 2. Weight: 1. *Anderson, Schomberg, and Tyrey*

Anesthesiology

Professor: Merel H. Harmel, M.D. (Johns Hopkins, 1943) *Chairman.*

Professors: Peter B. Bennett, Ph.D. (Southampton, England, 1964); David A. Davis, M.D. (Vanderbilt, 1941); Sara J. Dent, M.D. (Med. Coll. of South Carolina, 1945); Kenneth D. Hall, M.D. (Duke, 1953); Joannes H. Karis, M.D. (State Univ. of Utrecht, Holland, 1952); William J. Murray, Ph.D.

(Wisconsin, 1955), M.D. (North Carolina at Chapel Hill, 1962); Lloyd F. Redick, M.D. (Ohio State, 1958); Bruno J. Urban, M.D. (Albertus Magnus, Germany, 1960); Vartan Vartanian, M.D. (Cluj Univ. Med. School, Rumania, 1951); Stanley W. Weitzner, M.D. (New York Coll. of Med., 1953).

Associate Professors: Edmond C. Bloch, M.B., Ch.B. (Univ. of Cape Town, South Africa, 1946); Enrico Camporesi, M.D. (Univ. of Milan, Italy, 1970); Elisabeth J. Fox, M.B., B.S. (London Univ., 1955); John N. Miller, M.B., B.S. (Univ. of Sydney, 1963); Ingeborg H. Talton, M.D. (Frankfurt/Main, 1951), Ph.D. (Geissen, 1952).

Assistant Professors: Frank E. Block, Jr., M.D. (Virginia, 1976); Elaine M. Bukowski, M.D. (SUNY at Buffalo, 1974); Charles M. Christian II, Ph.D., M.D. (Louisiana, 1971, 1975); Radaslav Kosanin, M.D. (Univ. of Belgrad, Yugoslavia, 1965); Philip D. Lumb, M.B., B.S. (Univ. of London, 1974); Mohammad Maroof, M.D. (Liaquat Med. Coll., Pakistan, 1964); R. William McIntyre, M.D. (Univ. of British Columbia, 1970).

Assistant Medical Research Professors: Larry W. Burton, Ph.D. (Duke, 1977); David Harris, Ph.D. (Univ. of Leeds, U.K., 1974); Fritz F. Klein, Ph.D. (Duke, 1973); James L. Parmentier, Ph.D. (California at Santa Barbara, 1972); Marc D. Rafal, Ph.D. (Duke, 1980); Brij B. Shrivastav, Ph.D. (Univ. of Western Ontario, 1968); Sidney A. Simon, Ph.D. (Northwestern, 1973); Richard Vann, Ph.D. (Duke, 1976).

Assistant Clinical Professors: Luther C. Hollandsworth, M.D. (Bowman Gray, 1951); John A. Jarrell, Jr., M.D. (Johns Hopkins, 1949).

Associates: Fiona G. M. Clements, M.D. (Duke, 1975); Robert F. Evans, D.O. (College of Osteopathic Medicine, 1979); Theodore F. Hoffman, M.D. (North Carolina at Chapel Hill, 1978); Steve Lipson, M.D. (Louisville, 1979); Andrew Meyer, M.D. (New York Downstate, 1969); Ziaur Rahman, M.B. (Prince of Wales Med. Coll., India, 1968); Dianne L. Scott, M.D. (North Carolina at Chapel Hill, 1978).

Medical Research Associate: Arthur Dick, M.D. (Univ. of Western Ontario, 1977).

Research Associate: Michael Feezor, Ph.D. (North Carolina at Chapel Hill, 1969).

Electives

ANE-250(C). Clinical Acute Respiratory Physiology. Work in Anesthesiology Blood Gas Laboratory learning theory and practice of oxygen electrode, carbon dioxide electrode and pH meter and ancillary techniques, and in Recovery Room and Acute Care Unit. Study of ventilator problems. Terms: Fall 1 and 2, and Summer Term 1. Weight: *Hall and staff*

ANE-252(C). Clinical Anesthesiology II. Introduction to theory and practice of cardiopulmonary resuscitation, diagnostic and therapeutic nerve blocks, and clinical surgical anesthesia. Students will review physiology and pharmacology of anesthesia and perform general and regional anesthesia and will assist in postanesthetic respiratory care. Every term except first four weeks Spring 1 and Summer 2. Weight 2-8. *Harmel and staff*

ANE-253(C). Anesthesiology Research. In collaboration with the faculty, the student will work on a research project related to the physiology and pharmacology of anesthetics in a laboratory or clinical setting. Every term. Weight: 8. *Bennett and staff*

Biochemistry

James B. Duke Professor Robert L. Hill, Ph.D. (Kansas, 1954), *Chairman*.

Professors: Professor Emeritus Mary L. C. Bernheim, Ph.D., (Cambridge, England, 1928); James B. Duke Professor Irwin Fridovich, Ph.D. (Duke, 1955); Samson R. Gross, Ph.D. (Columbia, 1953); Walter R. Guild, Ph.D. (Yale, 1951); Jerome S. Harris, M.D. (Harvard, 1933); Henry Kamin, Ph.D. (Duke, 1948); Norman Kirshner, Ph.D. (Pennsylvania State, 1952); Kenneth S. McCarty, Ph.D. (Columbia, 1957); K. V. Rajagopalan, Ph.D. (Univ. of Madras, 1957); Robert Webster, Ph.D. (Duke, 1965).

Associate Professors: Robert M. Bell, Ph.D. (California, 1970); Ronald C. Greene, Ph.D. (California Inst. of Tech., 1954); Bernard Kaufman, Ph.D. (Indiana, 1961); William S. Lynn, Jr., M.D. (Columbia, 1946); Paul Modrich, Ph.D. (Stanford, 1973); David C. Richardson, Ph.D. (Massachusetts Inst. of Tech., 1967); Harvey J. Sage, Ph.D. (Yale, 1958); Lewis Siegel, Ph.D. (Johns Hopkins, 1965); J. Bolling Sullivan, Ph.D. (Texas, 1966).

Assistant Professors: Arno L. Greenleaf, Ph.D. (Harvard, 1974); Robert L. Habig, Ph.D. (Purdue, 1966); Michael Hirschfield, M.D. (Pennsylvania, 1967); Edward Holmes, M.D. (Pennsylvania, 1967); Tao-shih Hsieh, Ph.D. (California, 1976); Nicholas Kredich, M.D. (Michigan, 1962); Robert Lefkowitz, M.D. (Columbia, 1966); Patrick A. McKee, M.D. (Oklahoma, 1962); Salvatore V. Pizzo, M.D., Ph.D. (Duke, 1973); Deborah A. Steege, Ph.D. (Yale, 1974); Allen David Roses, M.D. (Pennsylvania, 1967); Robert W. Wheat, Ph.D. (Washington, 1955).

Assistant Medical Research Professors: Celia Bonaventura, Ph.D. (Texas, 1968); Joseph Bonaventura, Ph.D. (Texas, 1968); Marc G. Caron, Ph.D. (Florida, 1973).
 Adjunct Assistant Professor: Per-Otto Hagen, F.H.W.C. (Watt Univ. Scotland, 1961).
 Associates: John Bittikofer, Ph.D. (Purdue, 1971); Yasuhiko Nozaki, Ph.D. (Univ. of Tokyo, 1945).
 Research Associates: Stuart R. Adler, Ph.D.; Diane A. Albergo, Ph.D.; Michael J. Barber, Ph.D.; Thomas A. Beyer, Ph.D.; A Lien Lu Chang, Ph.D.; Debra A. Clare, Ph.D.; Margaret A. Cudd, Ph.D.; Doug J. Darr, Ph.D.; Allen Echardt, Ph.D.; Barry Ganong, Ph.D.; Susan Gidwitz, Ph.D.; Robert V. Hageman, Ph.D.; Jean Johnson, Ph.D.; Yasuhisa Kono, Ph.D.; Timothy J. Larson, Ph.D.; Carson R. Loomis, Ph.D.; Robert J. Mullin, Ph.D.; Gianni Pozzi, Ph.D.; Shirley Y. Pugh, Ph.D.; Lillie L. Searles, Ph.D.; Mark Scheidler, Ph.D.; Yasuhide Seki, Ph.D.; Albert Smith III, Ph.D.; Brian J. Terry, Ph.D.; Keith Wescott, Ph.D.

Required Courses

BCH-200. The core course given to all freshman medical students during a period of eighteen weeks in the first term—emphasizes the relationship between structure and function of the major classes of macromolecules in living systems including proteins, carbohydrates, lipids, and nucleic acids. The metabolic inter-relationships and control mechanisms are discussed as well as the biochemical basis of human diseases.

BCH-201. The required course in genetics for all first-year students—is given during fourteen weeks of the first term. The course emphasizes fundamental properties of the gene in relation to mutation, recombination, selection, replication, transcription, and translation, as well as the organization and structure of chromosomes. Human and medical genetics are emphasized to provide basic concepts necessary for understanding the origin and consequences of genetic variability. Approximately two-thirds of the lectures illustrate basic genetic problems.

With the staff's approval, some students with extensive formal training in genetics may be given the option of presenting a paper instead of taking examinations.

Electives

BCH-215(B). Molecular Genetics I: Genetic Mechanisms. A study of genetic mechanisms in molecular terms with emphasis on gene function, segregation and regulation in procaryotes and eucaryotes. The systems covered will include bacterial viruses, bacteria, plasmids, cellular organelles, and selected lower and higher eucaryotes. Course material will be drawn from the original literature and will be integrated as much as possible with Biochemistry 268. Terms: Fall 1 and 2. Weight: 3. *Gross and staff*

BCH-219(B).^{*} Molecular and Cellular Bases of Development and Differentiation. Emphasis is placed on the biochemistry of the cell surface as the basis of cell recognition, control of cell cycle, and overall tissue organization. An analysis of protein nucleic acid interactions in chromosome structure and function are considered in light of newer concepts of transcriptional and translational control. Studies also include nuclear cytoplasmic interactions as well as hormone induction of differentiation and development. The course is designed to study the phenomena of development and differentiation and has been organized on a multidisciplinary level. The course is part of the lecture series of the Molecular and Cellular Basis of Differentiation Study Program, MCD-301(B). Terms: Fall 1 and 2. Weight: 3-4. *McCarty, Counce, Kaufman, and Padilla*

BCH-234(B). Metabolic-Genetic Disease Seminar. Diseases of metabolism studied in detail with an emphasis on human genetics and inborn errors of metabolism. Format includes staff lectures, student seminars, patient presentations, textbook and literature reading. The group will be small enough to permit maximal personal interaction, particularly between students and faculty. Term: Spring 1. Weight: 3. *Kredich, Gross, Hill, and Holmes*

BCH-259(B). * Molecular Biology I. Protein and Membrane Structure/Function. Detailed concepts of the structure and function of proteins as enzymes and as structural elements of cellular substructures, including: protein primary structure and its determination, patterns of protein folding, mechanisms of enzyme catalysis and regulation, function and formation of multimeric protein assemblies, proteins and other constituents of biological membranes. Terms: Fall 1 and 2. Weight: 3. *Vanaman, Bell, Erickson, Rajagopalan, and J. Richardson*

BCH-268(B). * Molecular Biology II. Nucleic Acids. Consideration of structure and metabolism of nucleic acids in the context of their biological function in information transfer. Emphasis will be on the current research literature. Terms: Spring 1 and 2. Weight: 3. *Modrich, Burns, Bastia, and Steege*

BCH-276(B). * Comparative and Evolutionary Biochemistry. Lectures and discussion of the origin of life, evolution of the genetic code, mutation and protein polymorphism, natural selection and protein structure, and comparison of homologous proteins and nucleic acids. Laboratory work involves the purification and characterization of homologous proteins from fish and invertebrates. Techniques used include salt fractionation, electrophoresis, ion-exchange and molecular exclusion chromatography, fingerprinting, molecular weight determination, amino acid composition, and other related approaches. Terms: June-July; Summer 2. Weight: 6 per 5 weeks. *Sullivan*

BCH-288(B). * The Carbohydrates and Lipids of Biological Systems. The subjects will be considered in the following two general categories: (1) The relationship between structure and function; particularly, (a) cell surface carbohydrates as antigenic determinants and their relationship to viral and carcinogen transformation, (b) connective tissue mucopolysaccharides, (c) structural features of lipids and phase transitions. (2) Biosynthesis and catabolism. Terms: Spring 1 and 2. Weight: 2. *Kaufman*

BCH-291(B). * Physical Biochemistry. Principles of thermodynamics, hydrodynamics, spectroscopy, and X-ray diffraction and scattering are applied to biological systems. Biological molecules and macromolecules in both soluble and crystalline states are discussed. Terms: Fall 1 and 2. Weight: 3. *Richardson, Hsieh, and Sage*

BCH-292(B). * Proteins and Enzymes. Topics in protein chemistry including purification techniques, determination of primary structure, group specific modification and structure-function correlations. Mechanisms of action of enzymes, including the chemistry of nonprotein cofactors. Terms: Fall 1 and 2. Weight: 3. *Fridovich, Rajagopalan, Richardson, and Hill*

BCH-297(B). * Intermediary Metabolism. Lectures and student presentations on selected topics in the areas of metabolic regulation, bioenergetics, and other subjects of current research interest in metabolism. Terms: Spring 1 and 2. Weight: 3. *Siegel, Bell, Hill, Fridovich, and Rajagopalan*

BCH-299(B). * Nutrition. This course will examine the experimental basis for the identification and quantitation of requirements for calories, macronutrients, and micronutrients (vitamins and minerals). It will deal with the biochemistry of nutrition, with the assessment of nutriture, and with the biological effects of deficiency or excess of nutrients. This course will seek to define optimal nutriture and will search for the factual bases (if they exist) for commonly held beliefs on the nutrition of individuals and populations. The course will consist of informal lectures and, if possible, student seminars. Term: Fall 2. Weight: 2. *Kamin*

BCH-357(B). * Research in Biochemistry. In a limited number of cases, a student will be permitted to participate in the research program of a faculty

member. Acceptance is by individual arrangement with the proposed faculty preceptor. Terms: Fall 1 and 2. Weight: 1-8 per term. *Biochemistry faculty*

BCH-358(B). * Research in Biochemistry. In a limited number of cases, a student will be permitted to participate in the research program of a faculty member. Acceptance is by individual arrangement with the proposed faculty preceptor. Terms: Spring 1 and 2 or Summer Term 2. Weight: 1-8 per term. *Biochemistry faculty*

BCH-360(B). Clinical Chemistry Laboratory. Medical students may participate in the program of the Clinical Chemistry Laboratory on a tutorial basis. The course is tailored to the student's particular training needs. Students must receive the permission of the instructor. Terms: Fall 1 and 2, Spring 1 and 2. Weight: 4. *Bittikofer*

Community and Family Medicine

Professor: E. Harvey Estes, Jr., M.D. (Emory, 1947); *Chairman.*

Associate Professors: Stephen H. Gehlbach, M.D. (Western Reserve, 1968), M.P.H. (North Carolina at Chapel Hill, 1974), *Research Coordinator*; George R. Parkerson, M.D. (Duke, 1953), M.P.H. (North Carolina at Chapel Hill, 1977), *Education Coordinator.*

DIVISION OF BIOMETRY

Associate Professor: William E. Wilkinson, Ph.D. (North Carolina at Chapel Hill, 1968); *Chief.*
Professors: Thomas E. Frothingham, M.D. (Harvard, 1951); William E. Hammond, Ph.D. (Duke, 1967); Max A. Woodbury, Ph.D. (Michigan, 1948).

Associate Professors: Kerry L. Lee, Ph.D. (North Carolina at Chapel Hill, 1974); Robert A. Rosati, M.D. (Duke, 1967).

Assistant Professors: Daniel G. Blazer II, M.D. (Tennessee, 1969); Shirley A. Beresford, Ph.D. (Univ. of London, 1981); Elizabeth R. Delong, Ph.D. (North Carolina at Chapel Hill, 1979); Elizabeth S. Delzell, D.Sc. (Harvard, 1980), M.S.P.H. (North Carolina at Chapel Hill, 1977); Frank E. Harrell, Jr., Ph.D. (North Carolina at Chapel Hill, 1979); Carol C. Hogue, Ph.D. (North Carolina at Chapel Hill, 1974); Frederick R. Jelovsek, M.D. (Michigan, 1969); Kathryn Magruder-Habib, Ph.D. (North Carolina at Chapel Hill, 1978); Lawrence H. Muhlbaier, Ph.D. (North Carolina at Chapel Hill, 1981); Ramon Velez, M.D. (New York Univ., 1970).

Associate Medical Research Professor: Kenneth G. Manton, Ph.D. (Duke, 1974).

Assistant Medical Research Professor: Deborah V. Dawson, Ph.D. (North Carolina at Chapel Hill, 1981).

Research Associate: Michael Helms, B.S. (North Carolina at Chapel Hill, 1971).

DIVISION OF COMMUNITY AND OCCUPATIONAL MEDICINE

Assistant Professor: David C. Deubner, M.D. (Rochester, 1971), M.P.H. (North Carolina at Chapel Hill, 1973); *Chief.*

Professors: David M. Eddy, Ph.D. (Stanford, 1978); Leon Golberg, M.B., B.Chir. (Univ. Coll. Hospital Med. School, London, 1951); Clark C. Havighurst, J.D. (Northwestern, 1958); Siegfried H. Heyden, M.D. (Univ. of Berlin, Germany, 1951); Harmon L. Smith, Ph.D. (Duke, 1962).

Associate Professors: John K. Crellin, Ph.D. (Univ. of London, 1969), L.R.C.P., M.R.C.S. (Univ. of London, 1974); James F. Gifford, Jr., Ph.D. (Duke, 1969); Joseph Lipscomb, Jr., Ph.D. (North Carolina at Chapel Hill, 1975); Robert J. Sullivan, Jr., M.D. (Cornell, 1966), M.P.H. (North Carolina at Chapel Hill, 1973).

Assistant Professors: Deborah Bender, Ph.D., (American, 1980), M.P.H. (North Carolina at Chapel Hill, 1981); Allen R. Dyer, M.D. (Duke, 1972); John B. Nowlin, M.D. (Duke, 1959); Ruby L. Wilson, Ed.D. (Duke, 1968).

Adjunct Assistant Professor: Diana E. McGrath, Ph.D. (Pennsylvania, 1974).

Clinical Associate Professor: George W. Jackson, M.D. (Western Reserve, 1968).

Clinical Assistant Professors: Sigrid J. Nelius, M.D. (Ludwig Maximilian, Germany, 1949); Woodhall Stopford, M.D. (Harvard, 1969).

Clinical Associates: John W. Cromer, Jr., M.D. (Nebraska, 1972); James W. Osberg III, Ph.D. (North Carolina at Chapel Hill, 1980).

Associate: Beverly K. Rosen, M.S.W. (North Carolina at Chapel Hill, 1974).

DIVISION OF FAMILY MEDICINE

Associate Professor: Samuel W. Warburton, Jr., M.D. (Pennsylvania, 1969); *Chief*.

Associate Professors: Stephen H. Gehlbach, M.D. (Western Reserve, 1968), M.P.H. (North Carolina at Chapel Hill, 1974); George R. Parkerson, M.D. (Duke, 1953), M.P.H. (North Carolina at Chapel Hill, 1977).

Assistant Professors: Collins E. Baber, M.D. (Duke, 1973); James A. Bobula, Ph.D. (Ohio State, 1972); Frank V. De Gruy III, M.D. (South Alabama Coll. of Med., 1977); James T. Moore, M.D. (Columbia, 1971); Katherine A. Munning, Ph.D. (Iowa, 1979); Gregg A. Warshaw, M.D. (Michigan, 1976).

Associate: Catherine M. Severns, R.N.P. (Yale, 1971).

Clinical Assistant Professors: Don W. Bradley, M.D. (Med. Coll. of Virginia, 1976); Susan E. Brown, M.D. (Georgetown, 1976); Joyce A. Copeland, M.D. (North Carolina at Chapel Hill, 1975); Stephen W. Friedman, M.D. (Tulane, 1971); James L. Michener, M.D. (Harvard, 1978); Belinda R. Novik, Ph.D. (Michigan, 1972); R. Derek Prentice, M.B., Ch.B. (Edinburgh Univ., Scotland, 1970); Kathryn A. Sweeney, M.D. (Northwestern, 1975).

Clinical Associates: Melvin Berlin, M.D. (Duke, 1953); Howard J. Eisenson, M.D. (Duke, 1979); Joseph T. Hanlon, M.D. (North Carolina at Chapel Hill, 1981); Marci J. Kramish, M.P.H. (North Carolina at Chapel Hill, 1977); Barbara A. Morris, M.D. (Rochester, 1979); Barbara L. Patterson, B.S. (Johns Hopkins, 1977); Robert L. Rhyne, Jr., M.D. (New Mexico, 1977).

Clinical Instructor: Joseph W. Kertesz, Jr., M.A. (Michigan, 1973).

DIVISION OF PHYSICIAN'S ASSISTANT TRAINING

Assistant Professor: Michael A. Hamilton, M.D. (Rochester, 1964); *Chief*.

Associate Professor: Arthur C. Christakos, M.D. (South Carolina, 1955).

Assistant Professor: Malcolm Henderson Rourke, Jr., M.D. (Pennsylvania, 1963).

Instructors: Leaf R. Diamant, M.Ed. (North Carolina at Chapel Hill, 1973); Joyce Nichols, R.P.A. (Duke, 1970).

Adjunct Assistant Professor: Reginald D. Carter, Ph.D. (Bowman Gray, 1970).

Clinical Associates: Susan M. Edgman, B.H.S. (Duke, 1977); Carl M. Toney, R.P.A. (Duke, 1979).

Research Associate: Valerie Staples, B.A. (Connecticut Coll., 1970).

Adjunct Faculty

Adjunct Professors: Mario C. Battigelli, M.D. (Univ. of Florence, Italy, 1951), M.P.H. (Pittsburgh, 1957), Chapel Hill, N.C.; Barbara S. Hulka, M.D. (Columbia, 1959), M.P.H. (Columbia, 1961), Chapel Hill, N.C.

Adjunct Assistant Professors: James D. Bernstein, M.H.A. (Michigan, 1968); Thomas R. Howerston, A.B. (Duke, 1946), Durham, N.C.; Ralph E. Jennings, B.S. (East Tennessee, 1955), Durham, N.C.; Richard J. Levine, M.D. (St. Louis, 1971), Research Triangle Park, N.C.; Lawrence E. Myers, Ph.D. (California at Berkeley, 1972), Research Triangle Park, N.C.; Josephine E. Newell, M.D. (Maryland, 1949), Raleigh, N.C.

Adjunct Associates: Lynn C. Hartwig, M.A. (North Carolina at Chapel Hill, 1972), Hattiesburg, Miss.; Steven J. Hornberger, M.Div. (Harvard, 1970), Bolivia.

Clinical Faculty

Clinical Associate Professors: Charles Ellenbogen, M.D. (Chicago-Pritzker, 1964), Fayetteville, N.C.; William J. Kane, M.D. (Temple, 1969), Mount Holly, N.J.; F. M. Simmons Patterson, M.D. (Pennsylvania, 1939), Greenville, N.C.; David L. Swanson, Jr., M.D. (California at San Francisco, 1960), Fayetteville, N.C.

Clinical Assistant Professors: James C. Abell, M.D. (North Carolina at Chapel Hill, 1966), Statesville, N.C.; Joseph E. Agsten, M.D. (North Carolina at Chapel Hill, 1973), Kinston, N.C.; J. Powell Anderson, M.D. (Duke, 1949), Waynesboro, Va.; Tracy E. Barber, M.D. (Temple, 1943), Lexington, N.C.; Daniel H. Barco, M.D. (Duke, 1972), Durham, N.C.; James E. Barham, M.D. (Duke, 1974), Anderson, S.C.; James S. Blair, Jr., M.D. (Maryland, 1947), Wallace, N.C.; Donald E. Bley, M.D. (Duke, 1972), Fredericksburg, Va.; Charles C. Bremer, M.D. (Duke, 1964), Kinston, N.C.; Ellen T. Brubeck, M.D. (Ohio, 1975), Mount Olive, N.C.; Jack R. Cahn, M.D. (Pennsylvania State, 1972), Sparta, N.C.; Jane T. Carswell, M.D. (Med. Coll. of Virginia, 1958), Lenoir, N.C.; Jerry Cassuto, M.D. (New York Med. Coll., 1956), Greensboro, N.C.; Charles Davant III, M.D. (North Carolina at Chapel Hill, 1972), Blowing Rock, N.C.; Clyde J. Dellinger, M.D. (Duke, 1961), Drexel, N.C.; Julian M. Duttera, Jr., M.D. (Duke, 1968), La Grange, Ga.; John R. Dykers, Jr., M.D. (North Carolina at Chapel Hill, 1960), Siler City, N.C.; Curtis J. Eshelman, M.D. (Michigan, 1971), Durham, N.C.; Andrew L. Finn, Pharm.D. (Michigan, 1975), Research Triangle Park, N.C.; John S. Gaskin, Jr., M.D. (Duke, 1959), Albemarle, N.C.; Harry I. Geisberg, M.D. (Louisville, 1972), Anderson, S.C.; Wilbur J. Harley, M.D. (Jefferson, 1950), Winston-Salem, N.C.; Harold R. Imbus, M.D. (Cincinnati, 1954), Greensboro, N.C.; Lane E. Jennings, M.D. (Miami, 1975), Port Orange, Fla.; Eric M. Johnson, M.D. (Wayne State, 1977),

Albemarle, N.C.; Lyndon K. Jordan, M.D. (Duke, 1961), Smithfield, N.C.; Hervy B. Kornegay, Sr., M.D. (Bowman Gray, 1957), Mount Olive, N.C.; Charles W. Lapp, M.D. (Albany Med. Coll, 1974), Raleigh, N.C.; Richard E. Lassiter, M.D. (North Carolina at Chapel Hill, 1965), Chapel Hill, N.C.; Richard V. Liles, Jr., M.D. (North Carolina at Chapel Hill, 1957), Albemarle, N.C.; Robert H. McConville, Jr., M.D. (Indiana, 1972), Sanford, N.C.; Albert A. Meyer, M.D. (State Univ. of New York, 1975), Thomasville, Ga.; Robert S. Meyer, M.D. (Temple, 1974), Mount Olive, N.C.; David E. Miller, M.D. (Duke, 1973), Fayetteville, N.C.; Arlyn M. Moeller, M.D. (Iowa, 1956), Fayetteville, N.C.; James W. Mold, M.D. (Duke, 1974), Hillsborough, N.C.; William A. Nebel, M.D. (North Carolina at Chapel Hill, 1962), Chapel Hill, N.C.; Donald D. Neish, M.D. (Temple, 1958), Durham, N.C.; Robert B. Nieland, M.D. (Iowa, 1969), Hickory, N.C.; James G. Nuckolls, M.D. (Duke, 1966), Galax, Va.; Amos T. Pagter, Jr., M.D. (Duke, 1955), Tryon, N.C.; Henry B. Perry III, M.D. (Johns Hopkins, 1974), Ph.D. (Johns Hopkins, 1976), Bolivia; Melvin T. Pinn, M.D. (Virginia, 1976), Charlotte, N.C.; David C. Rockmore, M.D. (Med. Coll. of Virginia, 1975), Statesville, N.C.; Charles P. Scheil, M.D. (Duke, 1958), Lenoir, N.C.; Evelyn D. Schmidt, M.D. (Duke, 1951), Durham, N.C.; Jessica Schorr, M.D. (Tufts, 1977), Charlotte, N.C.; Robert H. Shackelford, M.D. (Bowman Gray, 1947), Mount Olive, N.C.; Philip G. Singer, M.D. (Duke, 1975), Hillsborough, N.C.; Hal M. Stuart, M.D. (Bowman Gray, 1956), Elkin, N.C.; William B. Tarry, Jr., M.D. (Med. Coll. of Virginia, 1953), Oxford, N.C.; Richard L. Taylor, M.D. (North Carolina at Chapel Hill, 1962), Oxford, N.C.; George R. Tucker, Jr., M.D. (North Carolina at Chapel Hill, 1955), Henderson, N.C.; W. Beverly Tucker, M.D. (North Carolina at Chapel Hill, 1966), Henderson, N.C.; Van J. Stitt, Jr., M.D. (North Carolina at Chapel Hill, 1975), Fayetteville, N.C.; William B. Waddell, M.D. (Duke, 1962), Galax, Va.; Joseph E. Walker, M.D. (Duke, 1960), Galax, Va.; Joseph B. Warren, M.D. (Duke, 1951), New Bern, N.C.; John W. Watson, M.D. (Med. Coll. of Virginia, 1953), Oxford, N.C.; Millard W. Wester, Jr., M.D. (Duke, 1952), Henderson, N.C.; James M. Wetter, M.D. (New York at Buffalo, 1974), Fayetteville, N.C.; Abner C. Withers, M.D. (North Carolina at Chapel Hill, 1962), Morganton, N.C.

Clinical Associates: Bruce O. Bailey, M.D. (Ohio State, 1975), Fayetteville, N.C.; Michael D. Fried, M.D. (New York Univ., 1971), Chapel Hill, N.C.; Raymond A. Gaskins, Jr., M.D. (North Carolina at Chapel Hill, 1975), Fayetteville, N.C.; Daniel Gottovi, M.D. (Rochester, 1965), Wilmington, N.C.; Peter J. Holland, M.D. (South Florida, 1977), Research Triangle Park, N.C.; John W. Lane, M.D. (Duke, 1972), Chapel Hill, N.C.; Walter L. Larrimore, M.D. (Louisiana, 1977), Bryson City, N.C.; Frank W. Leak, M.D. (North Carolina at Chapel Hill, 1967), Clinton, N.C.; Charles F. Martin, M.D. (Louisville, 1951), Greensboro, N.C.; Michael R. McIntyre, M.S.W. (Boston Coll., 1980), Fayetteville, N.C.; Yancey G. Mebane, M.D. (Duke, 1954), Mebane, N.C.; John W. Nance, M.D. (Bowman Gray, 1948), Clinton, N.C.; Latham C. Peak, M.D. (Bowman Gray, 1951), Clinton, N.C.; Eric A. Pyeritz, M.D. (Pittsburgh, 1978), Bryson City, N.C.; John L. Rouse III, M.D. (Bowman Gray, 1973), Clinton, N.C.; Thomas W. Stearns, Ph.D. (Florida, 1980), Fayetteville, N.C.; Robert H. Taylor, Pharm. D. (Tennessee, 1977), Fayetteville, N.C.; James W. Turpin, M.D. (Emory, 1955), Fayetteville, N.C.

Required Course

CFM-205. Clerkship in Family Medicine. This basic course in family medicine consists of an eight-week clinical clerkship in the second year. The educational goal is that students understand the principles of family medicine and the application of these principles in community practice. Emphasis is placed upon the provision of continuous comprehensive health care for people of both sexes and all ages within the context of their personal social support groups in the communities where they live. Of particular importance are ambulatory care, continuity of care, management of common health problems, and health maintenance. Students also study social factors, such as the doctor-patient relationship, family dynamics, the role of the physician in the community, ethical and legal issues, and the economics of health care delivery.

The clerkship is a two-part experience, approximately half with full-time family medicine faculty in the ambulatory health care facilities in Durham closely affiliated with the Duke University Medical Center, and the other half with practicing family physicians in communities other than Durham, but principally within North Carolina. In both components of the course the learning experience is centered upon patients which students help manage under the guidance of the departmental faculty. Patients are seen in a variety of sites, including the office, home, nursing homes, public health clinics, and community hospitals.

This experience offers the student a broad and realistic perspective of medicine and its relationship to other important institutions in the community. It also provides a basis for understanding the interdependent relationships between community and referral center physicians.

Electives

CFM-212(B). Organization and Management of Ambulatory Care Centers. A series of seminars to discuss ambulatory care systems. Material covered will be of interest to all students who will work in an office setting. Emphasis will be placed on the group practice as a mechanism for providing ambulatory health services. Topics of discussion will include the conceptual basis for organizing ambulatory care centers; center objectives; automated subsystems for registration, appointments, diagnostic studies, health providers and managers; marketing; human relations; professional recruitment and group selection; financial forecasting and budgeting. During the second term, discussions will center around specific areas of interest with participation in direct application. Terms: Fall 1 and 2. Weight: 1-2. *Boggs*

CFM-215(B).† Biostatistics in the Medical Sciences. A practical approach to statistical methods and their use in medicine and the related health sciences. Particular emphasis will be placed on issues in the design, conduct, and interpretation of clinical and epidemiologic studies. Topics covered will include data collection and management, as well as tests of statistical significance for rates and ratios as measures of disease risk; survival analysis; variable selection techniques; multivariate models for disease risk. Examples from real data and the medical literature will be used extensively. Term: Fall 2. Weight: 2. *DeLong*

CFM-225(B).† Digital Computers and Their Application in the Health Sciences. For students desiring an intensive exposure to medical computer applications. The flexible format of the course permits a variety of projects in computer medicine. Examples include projects in interactive patient interviewing; computer-aided instruction; patient/physician education; data collection, organization, retrieval, display, and analysis; and physician-assist programs. Every term. Weight: 1-8. *Hammond*

CFM-226(B). Historical Studies in a Medical Specialty. This elective is offered primarily to those who have made the choice of their probable career specialty. It is intended to provide an appreciation of the developments in that specialty and thereby deepen an understanding of it. While the choice of elective topic will be made on an individual basis and depend on the interests of each student, emphasis generally will be placed on specific theoretical, practical, and organizational developments since the second half of the nineteenth century. The format comprises selected readings, tutorials and student project. Every term. Weight: 1 or 2. *Crellin, Gifford, and English*

CFM-227(B).† Medicine in America. The historical development of medical science, the medical profession, and patterns of medical care in the United States. Topics covered will include bases of authority for the practice of medicine, the standing of the physician in society, medical education, medical sects, the evolution of hospital care, medical organizations, and health care delivery systems. The history of the Duke University Medical Center provides a closing recapitulation of course themes. Additional units of credit may be earned through independent study. Terms: Fall 2, Spring 2. Weight: 1. *Gifford*

CFM-229(B).† The Development of and Perspectives on Modern Medicine. Comprising lectures, discussion, and readings, this course outlines the general history of medicine, with particular attention given to recent developments. The course will include such topics as the contributions of William Harvey, aspects of clinical diagnosis, and the evolution of key concepts in modern medicine such as cell theory, the germ theory, anticepsis, and theories of immunity. Full use will be made of the excellent resources of the Trent Collections. Additional units of credit

†For further information, contact the Dean for Undergraduate Medical Education.

may be earned through independent study. Terms: Fall 1 or Spring 1. Weight: 1. *Gifford and Crellin*

CFM-230(B).† Comparison of Services for the Elderly—United States and United Kingdom. The delivery of services at the community level in the U.S. and U.K. will be compared. Problems will be discussed in terms of biology of aging, demography, utilization of health resources, economic and financial implications, and policy directions. Term: Spring 1. Weight: 1. *Moore*

CFM-232(B).† Medical Uses of Computers. An introductory course on applications of computers in clinical medicine. Special emphasis is given to various methods of collecting data from patients and making such data available for computer analysis. Working computer applications in several medical environments will be considered as examples, including visits to these units. The student will, in addition to the above, be taught the principles of computer programming through an exposure to a higher level computer language. Experience will include the writing of simple computer programs and hands on experience with computers and computer input and output devices. Terms: Fall 1 and 2. Weight: 3. *Hammond*

CFM-233(B).† Occupational Medicine. (Formerly Medicine and Industry). Student participation in projects being conducted in the Division of Occupational Medicine. Background material will be presented covering history of occupational (industrial) medicine, labor legislation, workmen's compensation and the Occupational Safety and Health Act (OSHA) of 1970. Clinical and epidemiological aspects of occupational diseases will be included, with emphasis on industrial hygiene and toxicology. Organization and administration of employee health programs will also be considered, with visits to representative establishments as part of the experience. Typical projects include such matters as evaluation of chemical exposures in the work environment, reactions of humans to chemical stress, medical evaluation of suspected cases of occupational disease. Terms: Fall 2, Spring 1 and 2, or Summer 2. Weight: 6. *Cromer, Stopford, Deubner, and Hansen*

CFM-234(B).* Seminar in Occupational Medicine and Toxicology. Seminar topics will relate to environmental hazards important in North Carolina. North Carolina has several important industries including agriculture, tobacco processing, textile manufacturing, and furniture manufacturing. Several occupational medicine physicians from local industries will be participants in this seminar series. Terms: Summer 2, Fall 2, and Spring 2. Weight: 2. *Cromer, Stopford, Deubner, and Hansen*

CFM-238(B).† Tutorial in Community and Family Medicine. An eight week, individually arranged experience in which the student participates in the research program of a faculty member. The subject matter, course weight, and meeting time will be arranged with the faculty member. Each student will meet regularly with the faculty preceptor and will carry out a project related to the preceptor's work. Through these discussions and project, the student will be able to develop an understanding of the discipline involved. Possible areas include management sciences, economic aspects of health care, computer technology, biostatistics, epidemiology, medical anthropology, health in the developing world, and organization of health care delivery in third world countries. Because of the variety of projects available and the necessity of prior arrangements, it is essential that interested students consult with the instructor or staff at least one month before the beginning of the term elected. Every term. Weight: 1-8 per term. *Parkerson and staff*

CFM-240(B).† Epidemiologic Principles and Methods. Topics covered in this course include study of the distribution of disease in populations, issues in

study design, data collection, and methods of analysis. Modules on the subjects of case-control, cohort, and cross-sectional studies, clinical trials, and intervention studies are presented. Epidemiologic approaches to the study of cancer, coronary artery disease, evaluation of medical care, infectious diseases, and mental illness will be covered. Methods are also introduced for assessing and dealing with bias, misclassification, and confounding. Primary reference papers serve as the main text for the course to enable students to gain facility in critical review of medical literature. Lectures will be supplemented by outside readings, seminars, and student presentations. Term: Fall 2. Weight: 2. *Grufferman, Blazer, Delzell, Feussner, Hamilton, Kimm, and Velez*

CFM-242(B).† Nutrition Epidemiology. Nutrition epidemiology may be defined as the study of the role of the nutrition factor in the *causal web* of illness patterns in human populations. This course offers a systematic review of population approaches to the study of nutrition. Currently, most nutrition courses are primarily concerned with studies using *in vitro* laboratory techniques, animal models, or individual human subjects, with minimal emphasis on human population groups in their natural environments. In the course, emphasis will be placed on methods available for chronic disease epidemiologic research since most nutritional disorders in man are basically chronic. Particular attention will be directed to principles of research design and critical analyses of selected studies. It is hoped that at the completion of the course, the student will be prepared to design and conduct population-based studies on human nutrition. Terms: Spring 1. Weight: 1-2. *Sue Y.S. Kimm*

CFM-219(C).† Tutorial in Clinical Epidemiology. Selected topics will be chosen for reading and discussion. Major emphasis is on cardio-cerebrovascular chronic-degenerative diseases, major neoplastic diseases, and industrial cancer screening; nutrition (cholesterol, sodium, potassium, 700 cal diet, etc.) Terms: Spring 1 and 2. Weight: 2. *Heyden*

CFM-221(C).† The Computer Textbook of Medicine. Students will participate in the writing and updating of the computer textbook of medicine. Information contained in the initial chapter of ischemic heart disease will be used to assist in the management of patients on the cardiology service. Every term. Weight: 2 and 4. *Rosati, Pryor, and Califf*

CFM-239(C). Community and Family Medicine Preceptorships. A preceptorship will be arranged for students to work with family physicians in community practice sites. In this way students can observe and participate in the delivery of health care to individual patients and their families within the context of the community in which they live. A wide variety of geographic locations and practice types are available. Limited options are available for practice in a setting in the developing world with the Andean Rural Health Project. Because of the necessity for prior arrangements with preceptors, it is essential that interested students contact the instructor as soon as possible and at least one month prior to the desired term. Terms: Fall 1 and 2, Spring 1 and 2, Summer 1 and 2. Weight: 4-9. *Parkerson and staff*

CFM-241(C).† Community Health Assessment. A tutorial in which the first term discussion will focus on various methods of assessing the health needs of a population. Particular emphasis will be given to the impact of cultural patterns of selected cultural and ethnic groups on the utilization of health services. Durham County will be the primary but not the sole model to be studied. In the second term tutorials will be of a practical nature and/or emphasize fieldwork. Students will visit one or more agencies concerned with the delivery, planning, or evaluation of health care. Terms: Fall 1 and 2, Spring 1 and 2. Weight: 1-3. *Bender and Hansen*

CFM-246(C).† Bioethics. Lectures, discussion, and readings in selected ethical questions raised by modern biomedical science and technology; including such topics as genetics and the "new biology," contraception, abortion, experimentation consent, behavior control, scarce medical resources, dying, and death. Terms: Fall 1 or 2. Weight: 1. *Smith*

CFM-247(C).† Philosophic Problems for Physicians. This seminar brings the resources of philosophy, literature, poetry, psychology, and sociology to bear on specific ethical and philosophical problems with which practicing physicians deal. The course proceeds with didactic and seminar presentations focusing on both medical-legal controversies and ethical dilemmas in the day-to-day practice of medicine. The historical as well as psychological roots of medical ethics will be explored in light of conflicting philosophies of science and medicine. The following topics will be among those offered for consideration: (1) the doctor-patient relationship and models of medicine; (2) ethical codes and laws; (3) meaning of informed consent; (4) abortion, euthanasia, eugenics, and definitions of death; (5) behavior control, psychotherapy, and psychosurgery in a free society; (6) medical judgment and medical regulations; (7) hypochondriasis, patient responsibility, and the unwanted patient; (8) professional detachment and commitment; and (9) value considerations in specialty choice. Terms: Spring 1 and 2. Weight: 2 or 4. *Dyer*

CFM-249(C).† Legal Issues in Medicine. A seminar which introduces participants to the basic approach of law and legal process to contemporary issues in medical care, including malpractice, hospital privileges, confidentiality, natural death, abortion and sterilization, consent/authorization for treatment, human experimentation, and peer review. Topics may be chosen by individual students. Common misconceptions about malpractice law and the rights of physicians and patients as well as the legal mechanisms for resolving disputes will be examined. Terms: Fall 1, Spring 2. Weight: 2. *Warren*

CFM-259(C). Advanced Clerkship in Family Medicine. Students will participate in the management of patients in local ambulatory primary care settings. These include the Duke-Watts Family Medicine Center, the Family Clinic of the University Health Services Division, the Durham County Health Department, and the offices of select practicing family physicians. Emphasis is placed upon comprehensive, continuous, excellent, personal care for individuals and families. Terms: Fall 1 and 2, Spring 1 and 2. Weight: 2-8. *Parkerson and staff*

CFM-261(C). Family Medicine Continuity Experience. Students will manage patients in the Family Medicine Center under supervision of faculty family physicians two half-days a week. Continuity of care is emphasized by providing comprehensive medical care to specific families over periods of two to eight months. Diagnostic coding and the problem-oriented record system are utilized. Terms: Fall 1 and 2, Spring 1 and 2. Weight: 2-8. *Parkerson and staff*

CFM-262(C). Field Study in Occupational Medicine. This eight-week course is intended to provide practical instruction in occupational medicine. It will include a minimum of sixteen hours of seminars, clinical experience in occupational medicine, a field experience at an established industrial health service, and a written analysis of an important occupational hazard within the industry. Every term. Weight: 6. *Cromer, Hansen, Stopford, and Deubner*

CFM-263(C). Relating to the Patient as a Family Doctor. Family dynamics and psychosomatic concepts are related to family medicine and primary care. Terms: Spring 1 and 2. Weight: 2. *Moore, Novik, and Kertesz*

CFM-267(C). Team Training for Primary Health Delivery. This course provides experience/study in primary care delivery, with emphasis on the concept

of the health care team, including professionals: family physician, clinical psychologist, nurse practitioner or physician associate, and health educator/community organizer. The student will consider alternate models for the use of the team approach in the United States and in the developing world. The student will be exposed to the team approach through seeing patients under the direction of the faculty, by observing the interaction of the team members, and by participating in the team's weekly case-oriented conferences. Every term. Weight: 4–8. *Perry and Bender*

CFM-269(C). Methods of Recording and Analyzing Clinical Data. Methods of indexing patient problems are presented as a basis for research studies in medical care. Students will record problems of patients encountered on their clinical rotations and perform analyses on these data. Terms: Fall 1 and 2, Spring 1 and 2. Weight: 1–4. *Parkerson*

CFM-270(C). Health Services Research. The student will develop and conduct a study in the area of health services research, including such general headings of quality of care, cost containment, patient satisfaction, and compliance with medical regimens. An option exists for students to study the impact of health services in a developing world setting. General headings for study include the above as well as rates of morbidity and mortality, population age structures and dependency ratios, health and illness beliefs and behaviors, health status, and evaluation of programmatic interventions. One or two credits will be given in one semester for project development, to be followed by 4 to 8 credits in a subsequent semester for performance of the research. Every term. Weight: 1–8. *Gehlbach, Perry, and Bender*

CFM-273(C).† The Ideal Physician. The elective will explore, from the perspectives of history and ethics, the concept of the ideal physician in relation to such figures as Hippocrates, Osler, and others, as well as students' and patients' conceptions of what a physician should be: technician and/or humanist. Term: Fall 1. Weight: 1–2. *Dyer and medical history staff*

CFM-274(C).† The Ideal Patient. This elective will focus, using the disciplines of history and ethics, on the physician's relationship with the patient and how to deal with patients' expectations of what medicine has to offer. Topics highlighted will include the growth of medical technology, concepts of disease, psychosomatic medicine, and the medicalization of life. Term: Fall 2. Weight: 1–2. *Dyer and medical history staff*

CFM-400(C). Geriatric Medicine. This elective is offered by the interdepartmental faculty of the Division of Geriatric Medicine. The student will work with faculty, fellows, and housestaff in a number of settings involved in the care of the geriatric patient. These will include the Geriatric Evaluation and Treatment Clinic (Duke), Geriatric Evaluation Unit and Clinic (Veterans Administration Medical Center), geriatric consultation services (Veterans Administration Medical Center, Durham County General Hospital, Duke), nursing home facilities, interactions with community services (Coordinating Council for Senior Citizens), home assessment, and others. Principles to be stressed will be biology and pathophysiology of aging; multiple clinical problems in the elderly; interdisciplinary team approach to evaluation, planning, and treatment; goals of maximal functional achievement and independence for the elderly. The student will participate actively in the workup and management of patients in both inpatient and outpatient settings as well as become more familiar with the problems of the elderly in the community. Familiarity with the growing literature in geriatric medicine will be encouraged and the student will participate in seminars, lectures, and team meetings at the appropriate sites including the Duke Center for the Study of Aging. Every term. Weight: 4 or 8. *Cohen, Cohn, Crawford, Friedman, Harrell, Moore, Neish, Simpson, Sullivan, and Warsaw*

Medicine

Professor: David T. Durack, M.B., B.S. (West Australia, 1969); D. Phil. (Oxford, 1963); *Acting Chairman*.

DIVISION OF CARDIOLOGY

Professor: Joseph C. Greenfield, M.D. (Emory, 1956); *Chief*.

Professors: Victor S. Behar, M.D. (Duke, 1961); Walter L. Floyd, M.D. (Johns Hopkins, 1954); John J. Gallagher, M.D. (Georgetown, 1968); Yi Hong Kong, M.D. (Natl. Defense Med. Ctr., Taiwan, 1958); Robert J. Lefkowitz, M.D. (Columbia, 1966); James J. Morris, M.D. (State Univ. of New York, 1959); Robert H. Peter, M.D. (Duke, 1961); Eugene A. Stead, Jr., M.D. (Emory, 1932); Andrew G. Wallace, M.D. (Duke, 1959); Robert E. Whalen, M.D. (Cornell, 1956).

Associate Professors: Fred R. Cobb, M.D. (Mississippi, 1964); Joseph R. Kisslo, M.D. (Hahnemann, 1967); Barbara C. Newborg, M.D. (Johns Hopkins, 1949); Edward Pritchett, M.D. (Ohio, 1971); Robert A. Rosati, M.D. (Duke, 1967); C. Frank Starmer, Ph.D. (North Carolina at Chapel Hill, 1968); Harold C. Strauss, M.D. (McGill, 1964); Galen S. Wagner, M.D. (Duke, 1965).

Assistant Professors: Augustus O. Grant, M.D. (Univ. of Edinburgh, 1971); Michael Hindman, M.D. (Illinois, 1973); Olaf von Ramm, Ph.D. (Duke, 1973); Judith L. Swain, M.D. (California at San Diego, 1974); Robert Waugh, M.D. (Pennsylvania, 1966); R. Sanders Williams, M.D. (Duke, 1974).

Associates: Robert M. Califf, M.D. (Duke, 1978); Lawrence D. German, M.D. (Boston, 1976); Richard S. Kent, M.D. (California, 1975); J. Randell Moorman, M.D. (Mississippi, 1978); Kenneth G. Morris, M.D. (Ohio, 1972); Harry R. Phillips, M.D. (Duke, 1975); David B. Pryor, M.D. (Michigan, 1976); Richard S. Stack, M.D. (Wayne State, 1976); Gary Stiles, M.D. (Vanderbilt, 1975).

Assistant Medical Research Professors: Marc G. Caron, Ph.D. (Miami, 1973); Philip McHale, Ph.D. (Duke, 1972); Judith C. Rembert, Ph.D. (North Carolina at Chapel Hill, 1972); William M. Smith, Ph.D. (Duke, 1970); Thomas R. Snow, Ph.D. (Duke, 1971).

DIVISION OF DERMATOLOGY

Professor: Sheldon R. Pinnell, M.D. (Yale, 1963); *Chief*.

Professor: J. Lamar Callaway, M.D. (Duke, 1932).

Assistant Professor: Sheldon V. Pollock, M.D. (Univ. of Toronto, 1974).

Assistant Medical Research Professor: Kay H. Singer, Ph.D. (Duke, 1977).

Medical Research Associate: Saood Murad, Ph.D. (California at Davis, 1978).

Associates: Gabriella Castillo, M.D. (Chicago, 1975); Madeleine Duvic, M.D. (Duke, 1976); John C. Murray, M.D. (Duke, 1977).

DIVISION OF ENDOCRINOLOGY

Associate Professor: Francis Neelon, M.D. (Harvard, 1962); *Chief*.

Professor: Harry T. McPherson, M.D. (Duke, 1948).

Associate Professors: Marc K. Drezner, M.D. (Pittsburgh, 1970); Jerome M. Feldman, M.D. (Northwestern, 1961); Charles Johnson, M.D. (Howard, 1963).

Assistant Professors: Warner Burch, M.D. (Bowman Gray, 1971); Mark Feinglos, M.D. (McGill, 1973); Kenneth S. McCarty, M.D. (Duke, 1972).

Associate: B. Titus Allen, M.D. (Duke, 1966).

DIVISION OF GASTROENTEROLOGY

Professor: Malcolm P. Tyor, M.D. (Duke, 1946); *Chief*.

Professor: Michael McLeod, M.D. (Duke, 1960).

Associate Professors: John T. Garbutt, M.D. (Temple, 1962); Paul Killenberg, M.D. (Pennsylvania, 1963); Thomas T. Long, M.D. (Bowman Gray, 1966); Charles M. Mansbach, M.D. (New York Univ., 1963); Steven H. Quarfordt, M.D. (New York Univ., 1960).

Assistant Professors: Jacqueline C. Hijmans, M.D. (Univ. of Leiden, 1951); Stuart Robinson, M.D. (Duke, 1973); James K. Roche, M.D. (Pennsylvania, 1969).

Associate: Thomas L. Johnson, M.D. (Texas, 1977).

DIVISION OF GENERAL MEDICINE

Professor: Patrick A. McKee, M.D. (Oklahoma, 1962); *Chief*.

Professor: Frank Lecocq,* M.D. (Illinois, 1954).

Associate Professor: George J. Ellis, M.D. (Harvard, 1963);

*Died, 12 June 1982.

Assistant Professors: John R. Feussner, M.D. (Vermont, 1973); KhinMae Hla, M.D. (Inst. of Med., Burma, 1971); Ramon Velez, M.D. (New York Univ., 1970); Eugene Linfors, M.D. (Duke, 1971).
Associates: J. Trig Brown, M.D. (Washington Univ., 1977); Robert T. Harris, M.D. (Emory, 1978).
Assistant Medical Research Professors: Larry J. Fretto, M.D. (California at Los Angeles, 1972); Mary Ellen Switzer, Ph.D. (Illinois, 1973).

DIVISION OF HEMATOLOGY

Professor: Wendell F. Rosse, M.D. (Chicago, 1958); *Chief*.
Professors: Harvey J. Cohen, M.D. (SUNY, 1965); John Laszlo, M.D. (Harvard, 1955); R. Wayne Rundles, M.D. (Duke, 1940); Harold R. Silberman, M.D. (Washington Univ., 1956).
Associate Professors: Andrew T. Huang, M.D. (Taiwan, 1965); Davor Vugrin, M.D. (Univ. of Zagreb, 1968).
Assistant Professors: Wayne Brenckman, M.D. (Yale, 1963); Edwin B. Cox, M.D. (Duke, 1971); Jeffrey Crawford, M.D. (Ohio, 1974); Russell Kaufman, M.D. (Ohio, 1973); Roger Kurlander, M.D. (Chicago, 1971); Joseph Moore, M.D. (Johns Hopkins, 1970); James E. Nidel, M.D. (Miami, 1973); J. Brice Weinberg, M.D. (Arkansas, 1969).
Associates: David R. Bishop, M.D. (Michigan, 1978); Theresa M. Blumfelder, M.D. (Missouri, 1973); B. Alton Brantley, M.D. (Duke, 1978); Charles J. Parker, M.D. (North Carolina at Chapel Hill, 1975); Thomas Reichert, M.D. (Miami, 1978).
Medical Research Professor: Joseph E. Sokal, M.D. (Yale, 1940).
Assistant Medical Research Professor: W. David Sedwick, Ph.D. (Pennsylvania, 1970).
Medical Research Associate: Emily Reisner, Ph.D. (Case Western Reserve, 1969).

DIVISION OF INFECTIOUS DISEASES

Professor: David T. Durack, M.B., B.S. (West Australia, 1969); D.Phil. (Oxford, 1973); *Chief*.
Associate Professors: Charles Ellenbogen, M.D. (Chicago, 1964); John D. Hamilton, M.D. (Colorado, 1964).
Assistant Professors: Harry A. Gallis, M.D. (Duke, 1967); Donald L. Granger, M.D. (Utah, 1972); John R. Perfect, M.D. (Med. Coll. of Ohio, 1975); Robert J. Sullivan, Jr., M.D. (Cornell, 1966).
Associate: G. Ralph Corey, M.D. (Baylor, 1973).

DIVISION OF NEPHROLOGY

Associate Professor: Vincent W. Dennis, M.D. (Georgetown, 1966); *Chief*.
Professors: James R. Clapp, M.D. (North Carolina at Chapel Hill, 1957); J. Caulie Gunnells, M.D. (South Carolina Med. Coll., 1956).
Associate Professors: Robert A. Gutman, M.D. (Florida, 1962); Robert H. Harris, M.D. (Georgia, 1966); William E. Yarger, M.D. (Baylor, 1963).
Assistant Professors: Peter C. Brazy, M.D. (Washington Univ., 1972); Paul E. Klotman, M.D. (Indiana, 1976); Richard M. Portwood, M.D. (Texas, 1954); William W. Stead, M.D. (Duke, 1973).

DIVISION OF NEUROLOGY

Professor: Allen D. Roses, M.D. (Pennsylvania, 1967); *Chief*.
Professors: James N. Davis, M.D. (Cornell, 1965); Albert Heyman, M.D. (Maryland, 1940); John B. Pfeiffer, Jr., M.D. (Cornell, 1942); Donald B. Sanders, M.D. (Harvard, 1964).
Associate Professors: James O. McNamara, M.D. (Michigan, 1968); Ara Tourian, M.D. (Iowa, 1958).
Assistant Professors: Barrie J. Hurwitz, M.B. (Witwatersrand Univ., 1968); J. Scott Luther, M.D. (North Carolina at Chapel Hill, 1976); E. Wayne Massey, M.D. (Texas, 1970); C. Warren Olanow, M.D. (Toronto, 1965); S. Clifford Schold, M.D. (Arizona, 1973).
Assistant Medical Research Professor: Margaret Pericak-Vance, Ph.D. (North Carolina at Chapel Hill, 1978).
Associates: Andrew Bragdon, M.D. (Washington Univ., 1977); Lindy E. Harrell, M.D. (Miami, 1977); Virginia Pact, M.D. (Karolinska Inst., 1977); Keshau R. Rao, M.D. (All India Inst. of Med., 1972); Donald E. Schmechel, M.D. (Harvard, 1974);

DIVISION OF PULMONARY-ALLERGY

Associate Professor: James D. Crapo, M.D. (Rochester, 1971); *Chief*.
Professors: Charles E. Buckley, M.D. (Duke, 1954); Johannes A. Kylstra, M.D. (Univ. of Leiden, 1952); William S. Lynn, M.D. (Columbia, 1946); Herbert A. Saltzman, M.D. (Jefferson, 1952); Herbert O. Sieker, M.D. (Washington Univ., 1948).

Assistant Professors: Albert O. Davies, M.D. (Utah, 1975); Khalil Kariman, M.D. (Meshed, 1969); Douglas G. Kelling, M.D. (Harvard, 1972); Neil MacIntyre, M.D. (Cornell, 1972); Claude Piantadosi, M.D. (Johns Hopkins, 1975); Lyn Thet, M.D. (Inst. of Med., Burma, 1971); Stephen L. Young, M.D. (California, 1968).

Associate: John R. Cohn, M.D. (Jefferson, 1976).

Assistant Medical Research Professors: Sambhu N. Bhattacharyya, Ph.D. (Univ. of Calcutta, 1969); Bruce Freeman, Ph.D. (California, 1978); Mary C. Rose, Ph.D. (Case Western, 1970).

Medical Research Associates: Nelson Leatherman, Ph.D. (Michigan, 1967); Sakti P. Mukherjee, M.D. (Univ. of Calcutta, 1973);

DIVISION OF RHEUMATIC AND GENETIC DISEASE

Professor: Ralph Snyderman, M.D. (State Univ. of New York, Downstate Med. Ctr., 1965); *Chief.*

Professors: Edward W. Holmes, M.D. (Pennsylvania, 1967); Grace P. Kerby, M.D. (Duke, 1946); Nicholas M. Kredich, M.D. (Michigan, 1962).

Associate Professors: Barton E. Haynes, M.D. (Baylor, 1973); Michael S. Hershfield, M.D. (Pennsylvania, 1967);

Assistant Professors: David S. Caldwell, M.D. (Bowman Gray, 1967); David S. Pisetsky, M.D. (Albert Einstein, 1973); Richard P. Polisson, M.D. (Duke, 1976); John R. Rice, M.D. (Miami, 1968).

Associates: Nancy B. Allen, M.D. (Tufts, 1978); Gale A. McCarty, M.D. (Duke, 1974); Mary L. Michels, M.D. (Ohio, 1978).

Medical Research Professor: George Cianciolo, Ph.D. (Miami, 1977); Linda McPhail, Ph.D. (Bowman Gray, 1976); Marilyn Pike, Ph.D. (Duke, 1979).

ADJUNCT FACULTY

Professors of Experimental Medicine: Pedro Cuatrecasas, M.D. (Washington, 1962); Gertrude B. Elion, D.Sc. (George Washington, 1969); Robert A. Maxwell, Ph.D. (Princeton, 1954); Charles A. Nichol, Ph.D. (Wisconsin, 1949).

Associate Professors: David W. Barry, M.D. (Yale, 1969); S. Duk Lee, Ph.D. (Maryland, 1961).

Assistant Professors: Kuttikkat Chandrabose, Ph.D. (Cornell, 1970); Richard DiAugustine, Ph.D. (Tulane, 1968); Thomas E. Eling, Ph.D. (Alabama, 1968); Gary E. R. Hook, Ph.D. (Victoria, 1968); Jo Ellen H. Lewtas, Ph.D. (North Carolina State Univ., 1973); Thomas L. Wenger, M.D. (Boston, 1971).

Associates: Thomas O'Neil, Ph.D. (California, 1974); Ralph Scallion, M.D. (Case Western, 1975); Thomas Wiltbank, M.D. (Tufts, 1968).

CLINICAL FACULTY

Clinical Professor: John R. Haserick, M.D. (Minnesota, 1941).

Associate Clinical Professors: Robert S. Gilgor, M.D. (Pennsylvania, 1962), Chapel Hill, N.C.; Harold L. Godwin, M.D. (Harvard, 1947), Fayetteville, N.C.

Assistant Clinical Professors: Syed Ahmed, M.D. (Dow Med. Coll., 1967), Danville, Va.; Thomas M. Bashore, M.D. (Ohio State, 1972), Fairfax, Va.; Walter E. Davis, M.D. (Duke, 1966), Durham, N.C.; Gloria F. Graham, M.D. (Bowman Gray, 1961), Wilson, N.C.; Thomas R. Harris, M.D. (Tennessee, 1955), Shelby, N.C.; John T. Joyner, M.D. (Bowman Gray, 1962), Asheville, N.C.; James R. Kelly, M.D. (Duke, 1970), Durham, N.C.; John C. Lumsden, B.S. (North Carolina State Univ. 1947), Raleigh, N.C.; Jesse Roberts, M.D. (Louisiana, 1961), Winston-Salem, N.C.; Mehrdad M. Sahla, M.D. (Isfahan Faculty of Med., Iran, 1957), Durham, N.C.; Charles W. Styron, M.D. (Duke, 1938), Raleigh, N.C.; Abe Walston, M.D. (Duke, 1963), Durham, N.C.; Khye Weng, M.D. (Univ. of Malaya, 1956), Durham, N.C.; Edward S. Williams, M.D. (North Carolina at Chapel Hill, 1954), Durham, N.C.

Clinical Associates: Sherwood W. Barefoot, M.D. (Duke, 1938), Greensboro, N.C.; Woodrow W. Batten, M.D. (Bowman Gray, 1944), Smithfield, N.C.; William R. Berry, M.D. (Duke, 1973), Raleigh, N.C.; Robert A. Buchanan, M.D. (Bowman Gray, 1969), Durham, N.C.; John R. Bumgarner, M.D. (Med. Coll. of Virginia, 1939), Raleigh, N.C.; Calvert R. Busch, M.D. (Med. Coll. of Wisconsin, 1969), Asheville, N.C.; Alexander Chiaramont, M.D. (Michigan, 1976), Cary, N.C.; F. Farrell Collins, M.D. (Vermont, 1972), Pinehurst, N.C.; George W. Crane, M.D. (Northwestern, 1946), Durham, N.C.; Michael S. Entmacher, M.D. (Duke, 1968), Durham, N.C.; Walter C. Fitzgerald, M.D. (Virginia, 1943), Danville, Va.; Harvey E. Grode, M.D. (Duke, 1960), Durham, N.C.; John H. Hall, M.D. (Duke, 1964), Greensboro, N.C.; H. LeRoy Izlar, M.D. (Duke, 1948), Durham, N.C.; George E. Koury, M.D. (Tulane, 1944), Burlington, N.C.; Stanley Levy, M.D. (Georgetown, 1971), Durham, N.C.; Thomas D. Long, M.D. (Bowman Gray, 1952), Roxboro, N.C.; Emmett S. Lupton, M.D. (New York Univ., 1938), Greensboro, N.C.; John A. Lusk, M.D. (Alabama, 1951), Greensboro, N.C.; Stuart H. Manning, M.D. (Duke, 1976), Durham, N.C.; Patricia M. Mauro, M.D. (Cornell, 1977), Chapel Hill, N.C.; Edmond Miller, M.D. (Duke, 1956), Durham, N.C.; W. S. Miller, M.D. (North Carolina at Chapel Hill, 1961), Raleigh, N.C.; John A. Moore, M.D. (Med. Coll. of Virginia, 1948), Greensboro, N.C.; Henry T. Perkins, M.D. (Duke, 1957), Raleigh, N.C.; Wade G. Rhoades, M.D. (Bowman Gray, 1960), Goldsboro, N.C.; Jack

G. Robbins, M.D. (Duke, 1948), Durham, N.C.; Richard J. Rosen, M.D. (George Washington, 1955), Greensboro, N.C.; Manfred Rothstein, M.D. (Duke, 1974), Fayetteville, N.C.; Michael B. Shipley, M.D. (Duke, 1974); Durham, N.C.; William V. Singletary, M.D. (Duke, 1943), Durham, N.C.; Robert B. Stewart, M.D., (West Virginia, 1974); Durham, N.C.; Raymond J. Toher, M.D., (Duke, 1974), Durham, N.C.; W. Harrison Turner, M.D. (Med. Coll. of Virginia, 1968), Durham, N.C.; William F. Uthe, M.D., (Med. Coll. of Ohio, 1974), Durham, N.C.; Ann Elise Weinrich, M.D., (Med. Univ. of South Carolina, 1978), Durham, N.C.; William G. Wysor, M.D. (Virginia, 1950), Durham, N.C.

Required Courses

The Department of Medicine traditionally has the responsibility of preparing students for a lifetime of learning as they give care to patients who ask them for help. The first step is to begin to think and act like a doctor.

MED-201. Introduction to Clinical Medicine. A course in the first year prepares the student to take an active role in patient care. The course is designed to introduce students to the methods involved in obtaining information about patients and their problems by means of accurate and complete history taking and performance of physical and laboratory examinations. Early in the course, students are taught the methods used in patient interviewing, the essentials of examination of various organ systems, and the techniques and meaning of the hematological and other laboratory examinations by means of introductory lectures and experience with patients on the ward and in the laboratory. Information obtained in the other first year courses is correlated with clinical manifestations of health and disease. The abnormalities found in the physical examination of certain organ systems are correlated with the abnormalities of laboratory values found. Patient conferences are used to demonstrate the value of obtaining all data about patients to solve their problems. Students are expected to learn to do this for patients with whom they have contact during ward sessions.

MED-205. The basic course in medicine for all students is the eight-week clinical clerkship in the second year. Students' desire to give good care is the motive which drives them to excellence. The student learns to identify problems of the patient and marshal the information obtained by past training. The student recognizes and attempts to focus the data learned from the basic sciences to specific clinical problems. Using patients as a means of integration, students should continue reading in anatomy, physiology, microbiology, pharmacology, and biochemistry. Problems encountered are discussed with fellow students, interns, residents, and senior staff to gain familiarity with ideas and concepts by actively manipulating them.

The goal of the Department of Medicine is for students to have as many learning experiences as possible by active participation. It is hoped that they will enjoy these learning experiences so much that they will continue them as long as they see patients. The goal is not to cover the entire field of medicine. Students will engage in extensive postdoctoral clinical or research training. The aims are to assist students in acquiring clinical skills and learning habits that will enable them to identify and solve new problems as they are encountered.

In caring for patients with ill-defined genetic and acquired differences with numerous unknown variables, many erroneous conclusions may be made. Students must learn to examine carefully oral and written statements, and inquire of all authorities the source of data which underlie their conclusions. One way for students to learn the difficulties in drawing accurate conclusions about biological systems is to give them opportunities to establish facts on the basis of their own research. This is a very effective method of teaching. The intellectual discipline involved better prepares the future clinician for the role of a lifetime of learning and enables academically oriented students to assess their own potentialities for investigative careers.

The second-year course in medicine is aimed at providing students with the basic tools used in the practice of medicine. This is the time when they should

consolidate the material learned during the first year and apply it to the study of their own patients. During a brief eight-week course it is not possible to cover the entire body of knowledge of internal medicine. Therefore, students are provided with a series of representative learning experiences based on the case study method. The goals are to teach methods of approach to patients and to provide a firm foundation for the solution of new medical problems as they are encountered in the months and years ahead.

Specific expectations of sophomore students are: (1) To obtain and carefully record meaningful histories and perform physical examinations on two or three patients each week. On the day of admission the student will review and compare findings with the responsible intern or resident. Difference of opinions should be discussed and, when possible, resolved by a return to the bedside. The following day students will present their data to the attending physician. The presentation should be well organized (with the help of the resident), and the presented illness should include a carefully reasoned documentation of the events in chronological order which led to the patient's hospitalization. It should contain pertinent facts leading to the most likely diagnosis and also the pertinent negative facts which weigh against a possible alternative diagnosis. (2) To examine their patients repeatedly and reflect on the diagnostic and therapeutic management. It is their responsibility to understand the objectives and to know the results and the interpretation of all diagnostic tests applied to their patients. They will actually perform as many of the necessary tests as possible and record their interpretations in frequent progress notes. (3) To read widely on topics related to their patients, particularly in applicable basic sciences to understand disease mechanisms. They should begin with the descriptions in standard textbooks of medicine which serve as a useful introduction to the subject. Special aspects of the patient's problem should be pursued in basic science or other textbooks, in monographs, or in relevant journals. (4) To know in depth those diseases present in their own patients, including different diagnostic features which distinguish those conditions from related diseases. At this stage of training they are not expected to have equivalent depth of knowledge of diseases that they have not yet encountered, but are responsible for knowing the major points about patients presented in rounds or at the various noon conferences. Principles of therapy should be understood, but details of drug regimens are better left for subsequent experiences. Students are encouraged to participate actively in all teaching exercises on the ward, whether or not their own patients are being discussed.

Electives

MED-210(C). Advanced General Medicine, Durham County General Hospital. Under the supervision of the junior assistant resident, the student will assume prime responsibility for the care of five to seven patients admitted to the teaching service at DCGH. Teaching input will come from the division of General Medicine (Duke) and the physicians whose patients are admitted to DCGH. Every term. Weight: 8. *Linfors, Neelon, McKee, Brown, and Corey*

MED-211(C). Advanced General Medicine in a Community Hospital (Cabarrus Memorial Hospital, Concord, N. C.). The student will be responsible for the management of inpatients under the supervision of a senior resident and the senior staff and will also be introduced to the management of patients by community physicians on an outpatient basis. Students interested in taking the course must apply and be interviewed for acceptance. Every term. Weight: 9. *Wagner, Long, and Kelling*

MED-213(C). Intensive Care—Duke. Students will perform at a subintern level in a very active intensive care unit. Students will rotate on an every other night basis under the supervision of junior assistant residents (JAR) and assistant

chief residents (ACR). Patient evaluations, procedures, diagnostic plans, and treatment plans are performed by the students under the direct supervision of the JAR, ACR, and attending physician. Daily didactic lectures in topics related to diagnosis and treatment of the critically ill will be given by senior staff involved in the intensive care unit. The physiological and biochemical approach to critical care medicine is stressed. Emphasis is placed on access to attending physicians for discussion of specific patient-oriented questions. Interested students should sign up in advance. Any preference for the month of rotation will be honored if possible. Every term. Weight: 4. *Kariman and Davies*

MED-214(C). Intensive Care Medicine-Veterans Administration Medical Center. This four-week course is open to three students who will rotate on an every third night call schedule. Under the supervision of junior assistant residents and a pulmonary fellow, the student will function as a junior intern and will be responsible for patient workups and daily bedside presentations. Students will be given responsibilities for procedures and decision making commensurate with their abilities. Daily attending rounds stress a physiologic approach to the management of critically ill patients. Each student will be provided with a syllabus of selected readings which will supplement regular didactic sessions on diagnosis, pathophysiology, and management of critical illness. Students are advised to arrange for a replacement if the course is dropped. Every term. Weight: 4. *Young*

MED-215(C). Clinical Dermatology. Students will be integrated into the dermatology program for one month. They will attend public and private outpatient clinics at Duke Hospital and the Veterans Administration Hospital. They will participate in inpatient teaching rounds, the clinical diagnostic conference, pathology conference, and basic science seminar. The course is designed to teach elements of dermatological diagnosis, management, and pathophysiology. Every term. Weight: 4. *Pinnell, Murray, Pollack, Callaway, Castillo, and resident staff*

MED-216(C). Clinical Dermatology. Student will be given a series of three lectures weekly using 35 mm Kodachromes to illustrate both clinical presentation and pathology in an effort to understand the pathologic physiology of dermatologic disorders and their management and treatment. Patient demonstrations will be made one-half day to greatly enhance clinical experience. Lecture and demonstration course only. See MED-215(C) for course offering 4 credits. Term: Spring 1. Weight: 2. *Pinnell, Pollack, Murray, Callaway, and Castillo*

MED-217(C). Gastroenterology. The role of the gastrointestinal tract and liver in health and disease is emphasized through use of liver and small bowel biopsy with morphological, biochemical, and physiological studies in the daily diagnosis and care of patients hospitalized on the gastroenterology inpatient service and general wards of Duke and V.A. Hospitals. Every term. Weight: 4 or 8. *Tyor, Garbutt, Mansbach, McLeod, Quarfordt, Killenberg, and Roche*

MED-218(C). Rational Basis for Practice of Gastroenterology. Topics will be selected which represent major hepatic and gastrointestinal diseases. The biological setting will be emphasized as the basis for diagnosis and management. Terms: Fall 1 and Spring 1. Weight: 2. *Tyor and gastroenterology staff*

MED-221(C). Metabolism and Endocrinology. A general course in which the whole patient is approached from an endocrine point of view. Clinical and laboratory diagnosis and titration of therapy are facilitated by the use of a standard data base and study of appropriate flow sheet parameters. The student participates in the evaluation and management of both inpatients and outpatients. Alternatives for eight credits include the V.A. consultation service, the Duke Staff and Clinical Research Unit Service, and the Duke Private Service Staff outpatient clinic and all

endocrine conferences are attended on each service. A 4-credit option (four weeks) allows one student to choose Drs. Ellis, Johnson, Feinglos, or McPherson as the clinical preceptor. The student will care for private inpatients and both staff and private outpatients under the preceptor's guidance. This option must be scheduled by the student with the preceptor before registering for the course. Every term. Weight: 4 or 8. *Neelon, McPherson, Ellis, Eisenbarth, Allen, Feldman, Johnson, Drezner, Feinglos, and Burch*

MED-222(C). Introduction to Clinical Neurology. Overview of clinical neurology for students planning careers other than internal medicine or neurology. Emphasis on clinical techniques in neurologic examination, approaches to neurologic diagnosis and anatomic, pathologic and physiologic basis for localization of neurologic lesions. Terms: Fall 1 and 2, Spring 1 and 2. Weight: 2. *Roses, Davis, and neurology staff*

MED-223(C). Clinical Clerkship in Neurology. A clerkship in clinical neurology emphasizing diagnosis and therapy of neurologic diseases. The students will participate in inpatient and outpatient workups, teaching conferences, and diagnostic studies. Includes MED-222 series and all activities scheduled for neurology residents. Opportunity for externship available. Every term. Weight: 4-8. *Roses and neurology staff*

MED-224(C). Allergy and Respiratory Diseases. Course provides training in clinical and laboratory aspects of allergic and respiratory illnesses. Rounds, seminars, and conferences are held throughout the week for instruction in allergy, clinical immunology, pulmonary function evaluation, pulmonary physiology, chest radiology, pulmonary pathology, and in clinical pulmonary medicine. Students will do their work on the Duke private pulmonary inpatient service, the Duke pulmonary consult service, or the V.A. pulmonary consult services. Every term. Weight: 4 or 8. *Crapo, Buckley, Davies, Kariman, Kylstra, MacIntyre, Piantaposi, Saltzman, Sieker, Thet, and Young*

MED-225(C). Outpatient Hematology-Oncology (Duke). On one half-day each week, the student will see and take part in the care of patients with hematological and oncological diseases in the outpatient setting. Diagnosis, long-term treatment, and supportive care of the patient will be stressed. Every term. Weight: 1. *Rosse*

MED-226(C). Outpatient Hematology-Oncology (Veterans Administration Medical Center). On one half-day each week, the student will see and take part in the care of patients with hematological and oncological diseases in the outpatient setting. Diagnosis, long-term treatment, and supportive care of the patient will be stressed. Every term. Weight: 1. *Weinberg*

MED-227(C). Rheumatic, Immunologic, and Genetic Diseases. The student acquires experience indepth in the recognition and care of patients with generalized connective tissue diseases, immunologic diseases, and metabolic arthropathies. The student evaluates patients on wards and in the clinic. Daily rounds with the staff extend the experience. Specialized laboratory and clinical techniques relating to immunologic and metabolic functions are learned. A comprehensive approach to the evaluation and treatment of patients with inflammatory immune deficiency and certain metabolic disorders is emphasized. May be taken for 4 units of credit with permission. Every term. Weight: 4 or 8. *Snyderman, Allen, Caldwell, Haynes, Hirshfield, Holmes, Kredich, McCarty, and Rice*

MED-229(C). Nephrology. A generalized course stressing the fundamentals of clinical nephrology and hypertension. The student participates fully in both inpatient and outpatient diagnosis and treatment. A broad exposure to consultative nephrology (acute and chronic renal failure, fluid and electrolyte management,

problem hypertension, etc.) as well as to the care of patients with end-stage renal failure (hemo- and peritoneal dialysis, transplantation) is offered. Special emphasis is placed on renal physiology and pathophysiology, renin-angiotensin metabolism, renal histopathology, and the interpretation of urinalysis. Attendance at regularly scheduled renal biopsy, transplantation, and general teaching conferences is required. Every term. Weight: 4 or 8. *Gutman, Dennis, Brazy, Clapp, Harris, Gunnells, Klotman, Stead, and Yarger*

MED-230(C). Clinical Hematology and Oncology (VA Hospital). This course provides a broad exposure to hematologic and oncologic disorders. As a member of the section the student actively participates in the following: (1) hematology-oncology consultation service for the VA wards, (2) hematology outpatient clinics, (3) management of inpatients with specific hematologic disorders. The wide variety of disorders seen includes leukemias, lymphomas, anemias, bleeding disorders, gammopathies, etc. An opportunity is provided for the student to learn and perform the specialized clinical and laboratory techniques involved in the evaluation of these patients. Ample time is available for contact with the hematology staff and library research. Every term. Weight: 4 or 8. *Weinberg, Cohen, Parker, Kurlander, Velez, Blumfelder, and Crawford*

MED-231(C). Clinical Hematology and Oncology (Duke Hospital). Students are given a unique opportunity to participate actively in care and study of patients with wide variety of hematologic diseases, anemias, bleeding disorders, leukemias, lymphomas, oncology problems, etc. Systematic, quantitative clinical evaluation, and basic techniques of blood and marrow examination, serum and urine protein studies are emphasized. Every term. Weight: 8 (4 with permission of Dr. Rosse). *Rosse, Brenckman, Reichert, Silberman, Moore, Huang, Laszlo, Cox, Neidel, and Kaufman*

MED-232(C). Preventive Cardiology: Clinical Applications. The aim of this course is to introduce clinical application of the current knowledge in preventive cardiology. The course will consist of didactic sessions and clinical case illustration. Topics will include epidemiology of coronary artery disease (CAD), CAD risk-factor modification such as clinical management of hyperlipidemias, stress management, physical fitness training, as well as the use of new technologies in early diagnosis of CAD and the current status of bypass surgery, etc. Term: Spring 2. Weight: 1. *Kimm and guest speakers*

MED-235(C). Research Topics in Medicine. The student will develop a research project in concert with one of the faculty, or participate in a current research study which may range from basic laboratory investigations to clinical epidemiology, or an integrated program containing aspects of both laboratory experience and clinical study design. Every term. Weight: 4. *McKee, Neelon, and Feussner*

MED-236(C). Research Topics in Endocrinology and Metabolism. Research training and experience in the field of endocrinology and metabolism. This is arranged individually between the student and a specific member of the endocrine staff. Every term. Weight: 8. *Neelon, Feldman, Drezner, Burch, and staff*

MED-242(C). Clinical Cardiology. A comprehensive experience in clinical cardiology is provided to students by participation in patient care, consultations, and laboratory evaluation of patients with known or suspected cardiovascular disease. Lectures and small group teaching will include bedside physical diagnosis, normal and pathologic cardiovascular physiology, electrocardiography, echocardiography, vectorcardiography, and pharmacology. Students will be based primarily at Duke or at the VA. Students should indicate a preference for their home base, but ultimate assignments will be made so that a proportionate number of

students are assigned to each institution. At the VA, students spend four weeks on a consultative service, one week in the cath lab and three weeks on the CCU. At Duke, the students spend three weeks on the consult service, two weeks in the cath lab, two weeks on the CCU and one week in the Cardiac Diagnostics Unit. The cardiology patient simulator (HARVEY) is used by all students both in individual and group sessions. All students will participate in the same core curriculum of lectures, held for the most part, between 10:00 A.M. and noon throughout the eight weeks. Once registered for this course, students may drop it anytime up until two weeks before the beginning of each rotation. Any student wishing to drop the course after this, will be allowed to do so only if he or she can provide a replacement student. The course roster will be held open to Duke medical students exclusively until two weeks before the beginning of each elective. If the course is not filled at that point, the roster will be opened to medical students from other institutions. Every term. Weight: 8. (D): *Waugh, Chen, Grant, Greenfield, Hindman, Kent, Kisslo, Kong, Peter, Pryor, Rosati, Stiles, and Wagner.* (VA): *Greenfield, Cobb, Morris, and Phillips*

MED-245(C). Coronary and Intensive Care Medicine. This is offered as an elective for the fourth year medical student who would like to spend time learning coronary and intensive care medicine within the setting of a community hospital. Emphasis is on cardiovascular medicine but there is a broad range of intensive care experience included. The fourth year student will work on a team with a medical senior assistant resident and will share night call every fourth night as the primary contact for new admissions to the medical intensive care unit and coronary intensive care unit at Durham County General Hospital. Teaching sessions are held four times weekly with emphasis on clinical material. Every term. Weight: 4 or 8. *Wagner*

MED-250(C). Clinical Allergy-Immunology. The specialist in allergy-immunology relies heavily on the use of laboratory techniques as an aid to patient evaluation. This elective is designed to familiarize the student with the clinical uses of the allergy-immunology laboratory. The course is oriented toward clinical, important departures from normal immune function. Precepted experience is provided in the evaluation of patients with impaired host resistance, hypersensitivity, autoimmunity, heightened susceptibility to neoplasia, and other immune disorders. Participation in clinically applicable immunoserologic methods is a part of the required course work experience. Selected readings, including a critical awareness of the recent literature, are used to gain an understanding of specific clinical problems. Terms: Fall 1 or 2, Spring 1 and 2. Weight: 8. *C. E. Buckley*

MED-252(C). Physiology of Nephrology. This course is composed of lectures designed to provide insight into the pathophysiology of clinical fluid and electrolyte problems. An attempt is made to integrate established physiologic principles into an analysis of common clinical problems. It is the intent of this course to equip the student with sufficient general information to permit adaptation of fluid and electrolyte therapy to the great variety of specific patient-related problems which will be encountered as a house officer. Terms: Fall 2 and Spring 1. Weight: 2. *Clapp and Gutman*

MED-256(C). Emergency Room. This course is designed to give the student a broad exposure to the clinical problems which are encountered in the emergency room. The student sees patients in the emergency room in collaboration with a medical resident, and is involved in their diagnostic evaluation and management. Didactic sessions are held twice weekly with the students, at which time clinical topics relevant to emergency medicine are discussed. The course is full time for four or eight weeks. Each student works in conjunction with one team of residents, twenty-four hours on, then twenty-four hours off. Every term. Weight: 4 or 8. *Lucas*

MED-260(C). Clinical Infectious Disease. This course will provide experience in the clinical and laboratory diagnosis of infectious diseases and their therapy. Emphasis will be placed on learning through active participation in infectious disease consultations, liaison with clinical microbiology, conferences, journal club, and tutorials. Drops will not be accepted within thirty days of the first day of classes unless the student finds a replacement. Adds will be accepted at any time, providing the course has not been filled. Every term. Weight: 4 or 8. *Durack, Gallis, Hamilton, Suydam Osterhout, Barry, Corey, Perfect, Klein, and Zwadyk*

MED-262(C). Diabetes Mellitus: A Camping Experience. Eagles Nest North Carolina Camp for Diabetic Children provides a two-week camping experience for over 200 children annually. Medical support is provided by medical, nursing, and physician associate students and dietetic interns, under University staff supervision. Each student is directly responsible for the management of one cabin of campers. The student participates in infirmary duty, prepares one of the daily staff seminars, and joins in the general camp activities. Room and board provided. Also offered in Nursing School. (Must be cleared in advance with Dr. Ellis, since students from other universities are also accepted.) Terms: June and August. Weight: 2. *Ellis, Eisenbarth, Morris, Delcher, and Skyler*

MED-264(C). Computer Aided Instruction in Clinical Neurology. The computer program simulates the patient-physician encounter in the practice of general medicine in which patients with common neurologic illnesses are seen. The purpose of the program is to teach the student the efficient and economical utilization of laboratory procedures, and the branching logic necessary in accurate neurological diagnosis. Terms: Fall 2, Spring 2. Weight: 2. *Heyman and Massey*

MED-266(C). Essentials of Rheumatic Disease. The purpose of this course is to give medical students the opportunity to review in the most concise and efficient manner the basic essentials of clinical rheumatic disease. The emphasis will be on clinical diagnosis and management. Term: Fall 1. Weight: 1. *Rice and Caldwell*

MED-268(C). Psychosocial Aspects of Medical Illness. Seminars and supervised clinical experiences on the medical wards and clinics will be used to provide the student with knowledge of basic principles and practical clinical skills relevant to determining the role of psychosocial factors in the etiology and course of physical disease in man. Also listed as PSC-268(C). Every term. Weight: 2. *Williams*

MED-281(C). Advanced General Medicine. The student is assigned to inpatient medical services at Duke or the Veterans Administration Medical Center, and participates actively in the workup and management of patients, under the supervision of the house staff. By special arrangement the student may function as a subintern at the VA Medical Center, and manage five to eight patients under the supervision of the ward resident. Every term. Weight: 8. *Wagner and staff*

MED-400(C). Geriatric Medicine. This elective is offered by the interdepartmental faculty of the Division of Geriatric Medicine. The student will work with faculty, fellows, and housestaff in a number of settings involved in the care of the geriatric patient. These will include the Geriatric Evaluation and Treatment Clinic (Duke), Geriatric Evaluation Unit and Clinic (Veterans Administration Medical Center), geriatric consultation services (Veterans Administration Medical Center, Durham County General Hospital, and Duke), nursing home facilities, interactions with community services (Coordinating Council for Senior Citizens), home assessment, and others. Principles to be stressed will be biology and pathophysiology of aging; multiple clinical problems in the elderly; interdisciplinary team approach to evaluation, planning and treatment; goals of maximal

functional achievement and independence for the elderly. The student will participate actively in the workup and management of patients in both inpatient and outpatient settings as well as become more familiar with the problems of the elderly in the community. Familiarity with the growing literature in geriatric medicine will be encouraged and the student will participate in seminars, lectures, and team meetings at the appropriate sites including the Duke Center for the Study of Aging. Every term. Weight: 4 or 8. *Cohen, Cohn, Crawford, Friedman, Harrell, Moore, Neish, Simpson, Sullivan, and Warshaw*

Microbiology and Immunology

James B. Duke Professor: Wolfgang K. Joklik, D. Phil. (Oxford, 1952), *Chairman*.

James B. Duke Professor: D. Bernard Amos, M.D. (Guy's Hospital, London, 1963).

Professors: Dani P. Bolognesi, Ph.D. (Duke, 1967); Rebecca H. Buckley, M.D. (North Carolina at Chapel Hill, 1958); Richard O. Burns, Ph.D. (Illinois, 1962); Eugene D. Day, Ph.D. (Delaware, 1952); Richard S. Metzgar, Ph.D. (Buffalo, 1959); Suydam Osterhout, M.D. (Duke, 1949), Ph.D. (Rockefeller Inst., 1959); Wendell F. Rosse, M.D. (Chicago, 1958); David W. Scott, Ph.D. (Yale, 1969); Hillard F. Seigler, M.D. (North Carolina at Chapel Hill, 1960); Ralph Synderman, M.D. (New York, Downstate Med. Ctr., 1965); Thomas C. Vanaman, Ph.D. (Duke, 1968); Frances E. Ward, Ph.D. (Brown, 1965); Robert W. Wheat, Ph.D. (Washington Univ., 1955); Catherine M. Wilfert, M.D. (Harvard, 1962); Hilda P. Willett, Ph.D. (Duke, 1949).

Adjunct Professors: James J. Burchall, Ph.D. (Illinois, 1963); Norman F. Weatherly, Ph.D. (Kansas, 1962).

Associate Professors: Deepak Bastia, Ph.D. (Chicago, 1971); Jeffrey J. Collins, Ph.D. (Harvard, 1972); Ronald B. Corley, Ph.D. (Duke, 1975); Peter Cresswell, Ph.D. (London, 1971); Jeffrey Dawson, Ph.D. (Case Western Reserve, 1969); David T. Durack, D.Phil. (Oxford, 1973); Stanley A. Gall, M.D. (Minnesota, 1962); Gale B. Hill, Ph.D. (Duke, 1966); Dolph Klein, Ph.D. (Rutgers, 1961); Thomas G. Mitchell, Ph.D. (Tulane, 1971); Harvey J. Sage, Ph.D. (Yale, 1958); Peter Zwadyk, Jr., Ph.D. (Iowa, 1971).

Visiting Associate Professor: Yasuo Ichihashi, Ph.D. (Kyoto Univ., Japan, 1969).

Adjunct Associate Professor: Lorraine Flaherty, Ph.D. (Cornell, 1973).

Associate Medical Research Professor: Hillel S. Koren, Ph.D. (Freiburg and Max Planck Inst., 1971).

Assistant Professors: Dolph O. Adams, M.D. (Med. Coll. of Georgia, 1965); Ralph R. Bollinger, M.D. (Tulane, 1970), Ph.D. (Duke, 1977); Charles E. Buckley III, M.D. (Duke, 1954); John C. Cambier, Ph.D. (Iowa, 1975); Sharyn Endow, Ph.D. (Yale, 1975); Harry A. Gallis, M.D. (Duke, 1967); Barton F. Haynes, M.D. (Baylor, 1973); Jack D. Keene, Ph.D. (Washington, 1974); David R. McClay, Jr. (North Carolina at Chapel Hill, 1971); David S. Pisetsky, Ph.D. (Albert Einstein, 1972), M.D. (Albert Einstein, 1973).

Assistant Medical Research Professors: Vickers Burdett, Ph.D. (Georgetown, 1973); Deborah V. Dawson, Ph.D. (North Carolina at Chapel Hill, 1981); Olivera J. Finn, Ph.D. (Stanford, 1980); William J. Hubbard, Ph.D. (Iowa, 1973); Sara E. Miller, Ph.D. (Georgia, 1972); Emily G. Reisner, Ph.D. (Case Western Reserve, 1969), Ph.D. (Duke, 1971); W. David Sedwick, Ph.D. (Pennsylvania, 1970); Carol C. Wisnant, Ph.D. (Duke, 1975).

Adjunct Assistant Professor: Lynn P. Elwell, Ph.D. (Oregon, 1974).

Associate: L. William Cashdollar, Ph.D. (West Virginia, 1978).

Medical Research Associates: Enrique G. Estevez, Ph.D. (Miami, 1976); Lizzie J. Harrell, Ph.D. (North Carolina State, 1978); Donna D. Kostyu, Ph.D. (Duke, 1979); David J. Pickup, Ph.D. (National Institute of Medical Research, London, 1979); Susan Radka, Ph.D. (Pittsburgh, 1977); Kay H. Singer, Ph.D. (Duke, 1977); Jenny P. Ting, Ph.D. (Northwestern, 1979); Susan Tonkongy, Ph.D. (Harvard, 1976); Vincent A. Varitek, Jr., Ph.D. (Duke, 1977); Alan C. Whitmore, Ph.D. (North Carolina at Chapel Hill, 1977); Larry L. Wright, Ph.D. (Georgia, 1975).

Lecturer: Alfred P. Sanfilippo, Ph.D. (Duke, 1975), M.D. (Duke, 1976).

Instructor: A. Proctor, M.S.

Research Associates: C. Boyer, Ph.D.; J. Chambers, Ph.D.; H. Charbonneau, Ph.D.; R. Chmelo, Ph.D.; R. Gaillard, Ph.D.; B. Gitter, Ph.D.; M. Golightly, Ph.D.; J. Gray, Ph.D.; B. Grouix, Ph.D.; M. Hollingsworth, Ph.D.; D. Howell, Ph.D.; W. Hu, Ph.D.; R. Klevit, Ph.D.; M. Langweiler, Ph.D.; McKolanis, Ph.D.; J. Melzer, M.D.; C. Ohlander, Ph.D.; T. Palker, Ph.D.; S. Pillai, Ph.D.; P. Reading, Ph.D.; B. Rup, Ph.D.; H. Shau, Ph.D.; M. Sirmon, Ph.D.; S. Somers, Ph.D.; R. Phipps, Ph.D.; M. Veigl, Ph.D.; L. Yates, Ph.D.

Required Courses

MIC-200. The core course for all freshman medical students—is given in the second semester of the first year. An intensive study is made of the common

bacteria, viruses, fungi, and parasites which cause disease in man. The didactic portion of the course focuses on the nature and biological properties of micro-organisms causing disease, the manner of their multiplication, and their interaction with the entire host as well as specific organs and cells. The role of the immune system and of specific chemotherapy on the host-parasite relationship are included.

The laboratory portion of the course is designed to acquaint students with the methods and procedures employed in bacteriological laboratories, to provide the basis for an understanding of cell-virus interactions and to demonstrate the nature of the more common pathogenic fungi and parasites. Clinical case histories are presented by the clinical staff to correlate this course with patient care.

MIC-201. A short core course in immunology for freshman medical students. The course includes a general introduction to the development of various special areas of immunology such as immunochemistry, immunohematology, and immunogenetics including transplantation and tumor immunology. The initial lectures describe the properties of antibodies, the characteristics of antigens, classes of reactive lymphocytes and accessory cells, the biology of substances released from lymphocytes (lymphokines) and the complement system. The course is enriched with clinical presentations and by discussion groups combined with practical demonstrations.

Electives

MIC-252(B).* **General Virology and Viral Oncology.** The first half of the course will be devoted to a discussion of the structure and replication of mammalian and bacterial viruses. The second half will deal specifically with tumor viruses, which are discussed in terms of the virus-cell interaction, the relationship of virus infection to neoplasia, and the role of the immunological response to tumor virus infection. The viral oncology part of the course may be taken for half credit in term 4. Permission of the instructors is required. Terms: Spring 1 and 2. Weight: 4. *Keene, Smith, Joklik, Bastia, Bolognesi, Collins, and Sedwick*

MIC-259(B).* **Molecular Biology I. Protein and Membrane Structure/Function.** Detailed concepts of the structure and function of proteins as enzymes and as structural elements of cellular substructures, including: protein primary structure and its determination, patterns of protein folding, mechanisms of enzyme catalysis and regulation, function and formation of multimeric protein assemblies, proteins and other constituents of biological membranes. Terms: Fall 1 and 2. Weight: 3. *Vanaman and staff*

MIC-268(B).* **Molecular Biology II. Nucleic Acids.** Consideration of structure and metabolism of nucleic acids in the context of their biological function in information transfer. Emphasis will be on the current research literature. Terms: Spring 1 and 2. Weight: 3. *Burns and staff*

MIC-269(B).* **Advanced Cell Biology.** An advanced course in cell biology with emphasis on current research literature, and featuring in-depth discussion of selected areas by staff engaged in research in these areas. The course covers membrane structure and physiology, the cytoskeleton, cell motility systems, chromosome mechanics, structure and function, and eukaryotic gene structure, control, and replication. Terms: Fall 1 and 2. Weight: 3. *Endow and staff*

MIC-291(B).* **Basic Immunology.** An intensive course in the biology of the immune system and the structure and function of its component parts. Major topics discussed are: structure, function, and specificity of immunoglobulins; immunoglobulin gene structure and expression; nature of antigens and haptenic determinants; anatomy of the lymphoid system; characteristics of primary and

secondary immune responses; complement components and their activities; cellular interactions; biologic role of histocompatibility antigens; regulation of growth, expression, and function of lymphocytes by antigen-specific and idiotype-specific cells and their products. Terms: Fall 1 and 2. Weight: 4. *Corley and staff*

MIC-296(B). Contemporary Molecular Immunology. A detailed study at the molecular level of some of the latest developments in immunology. The subject matter, although variable and continually updated to keep it fresh, will be concerned with three general areas: (a) the molecular analysis of the cellular components and processes which underlie the biological behavior of the cells involved in immune phenomena; (b) the chemical and physical properties of antigens and antibodies and the physical-chemical analysis of antigen-antibody interaction; (c) recent methodological advances contributing to or resulting from a and b. Term: Spring 1. Weight: 3. *Day, Cresswell, and Sage*

MIC-301(B). Principles of Infectious Disease. A lecture and seminar course to familiarize students with the basic biologic concepts, the pathogenesis, and the clinical manifestations of infectious diseases caused by bacteria, viruses, fungi, rickettsia, and selected parasites. The host defenses to infectious agents including the acute inflammatory response and humoral and cellular immunity, and current and future trends in the development of vaccines and antimicrobial and antiviral agents will also be discussed. Terms: Fall 1 and 2. Weight: 6. *Wilfert, Lehrman, Sebnack, Smith, Gutman, Katz, Durack, Mitchell, and Frothingham*

MIC-306(B). Clinical Microbiology-Immunology. A bench-training course in methods used in clinical microbiology stressing isolation, characterization, and antibiotic susceptibility testing of clinically significant microorganisms. Course conducted in Duke microbiology division laboratories. Prerequisite: permission of instructor. Terms: Fall 2, Spring 1 and 2. Weight: 8. *Klein*

MIC-308(B). Clinical Microbiology-Immunology. A bench-training course in methods used in clinical microbiology stressing isolation and characterization of clinically significant microorganisms. Course conducted in the V.A. Hospital microbiology laboratory. Every term. Weight: 8. *Zwadyk*

MIC-325(B).* Medical Mycology. Comprehensive lecture and laboratory coverage of all the fungi pathogenic for humans. Practical aspects as well as future trends in the mycology, immunology, diagnosis, pathogenesis, and epidemiology of each mycotic agent will be explored. There will be several invited lecturers, each an internationally recognized scientist, discussing their particular areas of mycological expertise and current research. Term: month of July. Weight: 4. *Mitchell*

MIC-330(B).* Medical Immunology. This is a comprehensive course in clinical immunology which attempts to define the role that immunology plays in the etiology, diagnosis, nosology, and therapy of human disease. The course includes some lectures on basic and applied immunology but many lectures are given by faculty members from clinical departments. Terms: Spring 1 and 2. Weight: 6. *Metzgar and staff*

MIC-336(B).* Immunogenetics. Basic concepts in genetic transmission, recombination, regulation. Elementary population genetics. Antigens of tissues and organs, distribution, extraction, and chemistry. Phylogeny of iso-antigenic systems of man and animals. Tests for histocompatibility including lymphocyte interactions and reactivity. Change in antigenicity and immune responsiveness in carcinogenesis. Immunologic factors in pregnancy and in homotransplantation of organs. Terms: Fall 1 and 2. Weight: 2. *Amos and Ward*

MIC-337(B).* Immunobiology of the Macrophage. A comprehensive study of the mononuclear phagocytic system. Areas to be discussed include the regula-

tion of the immune response by macrophages and their products, their functions in microbial infections and in tumor surveillance. Tissue distribution of monocytes and macrophages, and functional heterogeneity of macrophages. Terms: Fall 1 and 2. Weight: 2. Koren, Adams, Weinberg, and Snyderman

MIC-339(B). Diagnostic Microbiology and Infectious Disease. Introduction to the methods for the laboratory diagnosis of infectious disease and their clinical application. Basic biologic and clinical aspects will be correlated in a seminar-lecture format. Terms: every term except Fall 2 and Summer 1. Weight: 2. *Suydam Osterhout*

MIC-399(B). Preceptorship in Microbiology and Immunology. An individual reading and/or laboratory course in specialty areas supervised by an individual faculty member. Acceptance, nature of topic, and amount of credit by individual arrangement with proposed faculty member. Every term. Weight: 1-8 per 8 weeks. *Microbiology and immunology staff*

MIC-403(B). Investigative Problems in Disease Caused by Viruses, Mycoplasmas, Bacteria, and Fungi. Introduction to techniques for research with viruses, mycoplasmas, bacteria, and fungi; clinical experience with infectious diseases related to the investigative programs. The student will be involved in some aspect of laboratory research, and should consult with the investigator with whom work will be done prior to signing up for the course. Every term. Weight: 8. *Wilfert, Lehrman, Gutman, Durack, Hamilton, and Gallis*

MIC-405(B). Research in Immunoematology. The course is designed to provide the opportunity for students to select a project involving immunoematologic techniques and to pursue, through original research, the project conclusion. In particular, projects concerned with complement, red cell lysis, and red cell antigens will be stressed. Close supervision will be provided. Weekly seminars in immunoematology will be held. Library readings will be stressed. Terms: Fall 1 and 2, Spring 1 and 2. Weight: 6-8. *Rosse*

MIC-411(B).^{*} Molecular and Cellular Bases of Development and Differentiation. Emphasis is placed on the biochemistry of the cell surface as the basis of cell recognition, control of cell cycle and overall tissue organization. An analysis of protein nucleic acid interactions in chromosome structure and function are considered in light of newer concepts of transcriptional and translational control. Studies also include nuclear cytoplasmic interactions as well as hormone induction of differentiation and development. The course is designed to study the phenomena of development and differentiation and has been organized on a multidisciplinary level. The course is part of the lecture series of the development and differentiation study program, DDS-201(B). Terms: Fall 1 and 2. Weight: 3-4. *McCarty, Counce, Kaufman, and Padilla*

Obstetrics and Gynecology

Professor: Charles B. Hammond, M.D. (Duke, 1961), *Chairman*.

Professors: Arthur C. Christakos, M.D. (Med. Coll. of South Carolina, 1955); William T. Creasman, M.D. (Baylor, 1966); Stanley A. Gall, M.D. (Minnesota, 1962); Allen P. Killam, M.D. (Texas, 1960); Roy T. Parker, M.D. (Med. Coll. of Virginia, 1944); Charles H. Peete, Jr., M.D. (Harvard, 1947); David W. Schomberg, Ph.D. (Purdue, 1965).

Clinical Professor: Leonard E. Lafe, M.D. (Louisville, 1949).

Associate Professors: W. Allen Addison, M.D. (Duke, 1960); Arthur F. Haney, M.D. (Arizona, 1972); Gail B. Hill, Ph.D. (Duke, 1966); Frederick R. Jelovsek, M.D. (Michigan, 1963); Lee Tyrey, Ph.D. (Illinois, 1969).

Assistant Professors: Nels C. Anderson, Ph.D. (Purdue, 1964); David E. Barnard, M.D. (Vanderbilt, 1974); Jane E. Brazey, M.D. (Washington Univ., 1972); Daniel L. Clarke-Pearson, M.D. (Case, 1975); Kenneth Fortier, M.D. (Dartmouth, 1976); Arnold S. Grandis, M.D. (Duke, 1974); Vanessa P. Haygood, M.D. (Harvard, 1978); James F. Holman, M.D. (Arkansas, 1970); Charles H. Livengood III,

M.D. (Duke, 1976); Steve N. London, M.D. (Texas, 1978); Jeffrey V. May, Ph.D. (Rhode Island, 1978); David E. Miller, M.D. (Duke, 1973); Patricia M. Saling, Ph.D. (Pennsylvania, 1979); Ellen B. Smith, M.D. (North Carolina at Chapel Hill, 1977); John F. Steege, M.D. (Yale, 1972); Anna L. Stout, Ph.D. (South Carolina, 1980).

Assistant Clinical Professors: James L. Allen, M.D. (Emory, 1965); John V. Arey, M.D. (Harvard, 1946); John R. Ashe, Jr., M.D. (Duke, 1948); Rudy W. Barker, M.D. (North Carolina at Chapel Hill, 1967); Gary S. Berger, M.D. (Rochester, 1969); David B. Crosland, M.D. (North Carolina at Chapel Hill, 1958); Yancey G. Culton, Jr., M.D. (Duke, 1956); Jerry L. Danford, M.D. (Duke, 1967); Crowell T. Daniel, Jr., M.D. (Med. Coll. of Virginia, 1948); Michael D. Fried, M.D. (New York, 1971); Carl A. Furr, Jr., M.D. (North Carolina at Chapel Hill, 1958); E. C. Garber, Jr., M.D. (Med. Coll. of Virginia, 1944); Michel Goubran, M.D. (Cairo, Egypt, 1962); John W. Lane, M.D. (Duke, 1972); Richard L. Lassiter, M.D. (North Carolina at Chapel Hill, 1965); Donald T. Moore, M.D., (Meharry, 1958); William A. Nebel, M.D., (North Carolina at Chapel Hill, 1962); Phillip H. Pearce, M.D. (Duke, 1960); Steven M. Scott, M.D. (Indiana, 1974); Robert K. Yowell, M.D. (Duke, 1961).

Associates: Robert D. Eden, M.D. (State Univ. of New York, 1978); Donald B. Maier, M.D. (Hahnemann, 1978); John T. Soper, M.D. (Iowa, 1978); Camille J. Wahbeh, M.D. (Lebanon, 1980).

Clinical Associates: Francis S. Gardner, Jr., M.D. (Maryland, 1951); Ronald E. Granger, M.D. (California at Irvine); Bennet A. Hayes, M.D. (North Carolina at Chapel Hill, 1957); Clayton J. Jones, M.D. (Tennessee, 1952); Glenward T. Keeney, M.D. (Med. Coll. of Virginia, 1967); William R. Lambeth, M.D. (Bowman Gray, 1974); Jack P. McDaniel, M.D. (North Carolina at Chapel Hill, 1956); Dudley C. Miller, M.D. (Missouri, 1959); E. Frank Shavender, M.D. (North Carolina at Chapel Hill, 1968); Joseph A. Stephens, M.D. (Pittsburgh, 1952); Thomas A. Stokes, Jr., M.D. (Duke, 1955); Allen H. Van Dyke, M.D. (Bowman Gray, 1971); Paul A. Vieta, M.D. (New Jersey, 1966); Bertram E. Walls, M.D. (Duke, 1972).

Research Associates: Sarah T. Bierly, M.D.; Louise A. Kaufmann, B.A.; Lawrence Kodack, B.A.

Required Course

In Introduction to Clinical Medicine the first-year student receives instruction in the fundamentals of obstetric and gynecologic history and pelvic examinations.

OBG-205. Required of all second-year students—consists of nine weeks in general obstetrics and gynecology. Students attend lectures, work daily in the general and special outpatient clinics, and are assigned patients on the obstetric and gynecologic wards. Students share in patient care, teaching exercises, and in daily tutorial sessions with the faculty. Clinical conferences, a gynecologic-pathology conference, endocrine conferences, and correlative seminars and lectures are included.

Electives

OBG-210(C). Gynecologic Cancer. This course presents a clinical experience in the management of the patients with a gynecologic malignancy. The student will assume the role of an extern. Outpatient, inpatient, and operative exposure to these patients will be extensive. Every term. Weight: 4 or 8. *Creasman, Clarke-Pearson, Parker, Barnard, Smith, and Soper*

OBG-212(C). Tutorial in Epidemiologic Principles in Obstetrics-Gynecology. Tutorial designed to present basic principles of epidemiology and biostatistics in obstetrics and gynecology. Also to assist the student to interpret data and to aid experimental design. Appropriate for public health applications in obstetrics and gynecology. Every term. Weight: 1. *Berger and Gary*

OBG-213(C). Preparation for Practice, Cape Fear Valley Hospital, Fayetteville Area Health Education Center. This is a unique opportunity to receive both didactic exposure and clinical experience in obstetrics and gynecology in Cape Fear Valley Hospital, a large community hospital in Fayetteville, North Carolina, where almost 4,000 patients are delivered each year. The student will actively participate in the care of patients in the labor and delivery rooms, assist at surgery, and render postoperative care. This is a community hospital experience rather heavily weighted in clinical obstetrics. Students will be exposed to a large volume of clinic opportunities. Two senior residents from Duke rotate through Cape Fear Valley Hospital. The student will be directly supervised by Dr. David

Miller (full-time Duke faculty at Cape Fear) and Dr. Ed Garber, in addition to Duke obstetrics and gynecology residents. Every term. Weight: 4. *Jelovsek, Miller, Garber, and staff of Cape Fear Valley Hospital*

OBG-229(C). Endocrinology Seminar. Sessions with discussion of interesting clinical problems and related clinical and basic research in gynecologic endocrinology. Every term. Weight: 1. *Haney, Hammond, Schomberg, Tyrey, Sahling, and fellows on Endocrine Division*

OBG-231(C). Clinical Reproductive Endocrinology. Course for students who desire additional basic and clinical experience in examination, diagnosis, and treatment of obstetric and gynecologic patients with endocrinopathy and infertility. Course consists of instruction in clinical reproductive problems correlated with examination and treatment of patients both in the Endocrinology Outpatient Clinic and in the hospital. Every term. Weight: 4. *Haney, Hammond, Schomberg, Tyrey, Sahling, and fellows on Endocrine Division*

OBG-239(C). Perinatal Medicine. A study of the relationship of clinical factors during pregnancy, labor, delivery, and the first month of life. Emphasis will be placed on abnormal conditions of pregnancy as related to the infant, prenatal pathological conditions adversely afflicting the fetus and newborn, and early management of the infant. Current problems in maternal-fetal relationships will be outlined. The clinical rotation will consist of half time on the high-risk obstetric service and half time on the nursery service. (Duke North, ICN, or Duke South nurseries.) See also PED 239 and PED 225. Every term. Weight: 8. Must contact Gall prior to registration. *Gall*

OBG-243(C). Sex Education. This course is designed to prepare health professionals for dealing with situations involving sex education and counseling. A



series of fourteen undergraduate lectures, given as part of the undergraduate course, Zoology 198.6, "Human Sex and Sexuality," will survey biological, psychological, sociocultural, and ethical aspects of human sexuality. Additional training sessions, specifically for medical students, will deal with the design, organization, and implementation of educational and counseling programs. The final eight weeks of the course will be spent gaining practical experience. Projects may be of the student's design, approved by the committee, or the student may participate in one of the ongoing projects of the committee such as teaching the seventh grade curriculum in the public schools. Terms: Spring 1 and 2. Weight: 3. *Steege, Christakos, and Shirley Osterhout*

OBG-245(C). Office Gynecology. For students preparing for general practice, medicine, pediatrics, and surgery. Outpatient clinic and emergency room diagnosis and patient care are taught. Every term. Weight: 4 or 8. *Parker and staff*

OBG-247(C). Clinical Obstetrics. For students preparing for general practice and medicine or pediatrics. Antepartum, intrapartum and postpartum patient care are stressed and practical experience in the delivery room is provided at an intern level. Every term. Weight: 4 or 8. *Gall, Killam, Grandis, and fellows on obstetrical service*

OBG-249(C). Clinical Gynecology. For students preparing for general practice, surgery, and urology. Preoperative diagnosis and preparation and postoperative care are stressed. In addition, minor operative procedures are taught and students assume the responsibilities of an intern. Every term. Weight: 4 or 8. *Peete, Addison, Christakos, Livengood, Fortier, Haygood, and staff*

OBG-250(C). Psychosomatic Gynecology. For students in obstetrics and gynecology, family practice, and internal medicine. This course will emphasize clinical experience in the diagnosis and treatment of chronic pain, as well as the management of other psychosomatic and psychophysiologic problems in gynecologic practice. Clinical research may be undertaken by arrangement. Must contact Dr. Steege prior to registration. Every term. Weight: 1-3. *Steege and Stout*

OBG-253(C). Preparation for Practice, Cabarrus Memorial Hospital, Concord, North Carolina. This is an opportunity to receive both didactic exposure and clinical exposure in obstetrics and gynecology in the community hospital. The student will be expected to function as an intern and will participate actively in the care of the patients in the labor and delivery area, assist at surgery, and render postpartum and postoperative care. This is a community hospital experience rather heavily weighted in clinical obstetrics. The student will be exposed to a large volume of clinical material. The practitioners in the community are all board-certified obstetricians and gynecologists and are interested in student teaching. A Duke faculty person will provide additional guidance by visits once per week. This elective can be taken for four weeks for 4 units or eight weeks for 8 units. The student will be housed in quarters available for them. Every term. Weight: 4, 6, or 8. *Clarke-Pearson, Ashe, and staff of the Cabarrus Memorial Hospital*

Ophthalmology

Professor: Robert Machemer, M.D. (Freiburg, Germany, 1959), *Chairman*.

Professors: W. Banks Anderson, Jr. M.D. (Harvard, 1956); Gordon K. Klintworth, M.D. (Univ. of Witwatersrand, 1957), Ph.D. (Univ. of Witwatersrand, 1966); Maurice B. Landers III, M.D. (Michigan, 1963); Joseph A. C. Wadsworth, M.D. (Duke, 1939); Myron L. Wolbarsht, Ph.D. (Johns Hopkins, 1958).

Associate Professor: M. Bruce Shields, M.D. (Oklahoma, 1966).

Assistant Professors: Michael L. Cobo, M.D. (Harvard, 1975); Gary N. Foulkes, M.D. (Columbia, 1970); John A. Jarrell, M.D. (Vanderbilt, 1952); Brooks W. McCuen II, M.D. (Columbia, 1974).

Clinical Professors: Arthur C. Chandler, Jr., M.D. (Duke, 1959); Samuel D. McPherson, Jr., M.D. (Johns Hopkins, 1943); Henry G. Wagner (Johns Hopkins, 1953).

Assistant Clinical Professors: John W. Cline, M.D. (North Carolina at Chapel Hill, 1966); Robert D. Dawson, M.D. (Meharry, 1943); Edward M. Hedgepeth, M.D. (North Carolina at Chapel Hill, 1962);

Thomas C. Kerns, M.D. (Duke, 1950); Judy H. Seaber, B.A. (Emory, 1962); Charles F. Sydnor, M.D. (Virginia, 1969); James S. Tiedeman, M.D. (Duke, 1977).

Clinical Associates: Dorothy Bell, M.D. (North Carolina at Chapel Hill, 1980); Joseph M. Corless, M.D. (Duke, 1974); J. Thomas Foster, M.D. (Duke, 1958); William R. Harris, M.D. (North Carolina at Chapel Hill, 1956); Edward K. Isbey, Jr., M.D. (Wayne, 1955); John H. Killian, M.D. (Bowman Gray, 1967); Martin J. Kreshon, M.D. (Marquette, 1954); W. Hampton Lefler, M.D. (Bowman Gray, 1963); Edward E. Moore, M.D. (Harvard, 1942); Lawrence Moore, M.D. (Duke, 1963); Harold E. Shaw, Jr., M.D. (Med. Univ. of South Carolina, 1973); Larry Turner, M.D. (Duke, 1944).

Research Associate: William A. Harris (East Carolina, 1967).

Electives

OPH-210(C). Medical Ophthalmology. The ophthalmic signs and symptoms of systemic disease are presented in a lecture series. Oriented for those students interested primarily in pediatrics, internal medicine, or ophthalmology. Terms: Fall 1 and 2, Spring 1 and 2. Weight: 1. *Shields and Foulks*

OPH-212(C). General Ophthalmology. A clinical preceptorship in which the student will participate and observe in the regular house staff activities, conferences, lectures, patient care, and treatment including surgery. Emphasis on the use of specialized ophthalmic apparatus is emphasized. Every term. Weight: 3-8. *Chandler and Shields*

OPH-213(C). Ophthalmic Pathology. The student will review all ophthalmic pathology specimens submitted weekly and any pertinent permanent specimens, and will aid in presentation of cases at weekly ophthalmic pathology conferences. Every term. Weight: 1. *Klintworth*

OPH-214(C). Investigative Ophthalmology. The student is assigned a project relating to basic ophthalmologic problems. Technical assistance, sufficient equipment and laboratory animals are supplied for the completion of the project. The student is expected to attend lectures scheduled for the house staff. Every term. Weight: 4-8. *Landers, McCuen, Wolbarsht, and Anderson*

OPH-215(C). Ocular Diseases in Children. The study of ocular disease in children includes muscular imbalances, congenital disorders, and neoplastic diseases to acquaint the student with a special pediatric and ophthalmologic phase. Every term. Weight: 1. *Seaber*

Pathology

Professor: Robert B. Jennings, M.D. (Northwestern, 1950), *Chairman*.

Professors: Dolph O. Adams, M.D. (Med. Coll. of Georgia, 1965); Ph.D. (North Carolina at Chapel Hill, 1972); Darell D. Bigner, M.D. (Duke, 1965), Ph.D. (Duke, 1971); Edward H. Bossen, M.D. (Duke, 1965); William D. Bradford, M.D. (Western Reserve, 1958); Bernard F. Fetter, M.D. (Duke, 1944); Donald B. Hackel, M.D. (Harvard, 1946); William W. Johnston, M.D. (Duke, 1959); Gordon K. Klintworth, M.D. (Univ. of Witwatersrand, 1957), Ph.D. (Univ. of Witwatersrand, South Africa, 1966); John A. Koepke, M.D. (Wisconsin, 1956); Philip C. Pratt, M.D. (Johns Hopkins, 1944); Kenneth A. Schneider, M.D. (Northwestern, 1959); Joachim R. Sommer, M.D. (Munich, 1951); F. Stephen Vogel, (Western Reserve, 1944); Benjamin Wittels, M.D. (Minnesota, 1952).

Adjunct Professor: Paul Nettesheim, M.D., D.M.S. (Bonn, West Germany, 1959).

Associate Professors: Peter C. Burger, M.D. (Northwestern, 1966); Jane G. Elchlepp, M.D. (Chicago, 1955), Ph.D. (Iowa, 1948); Doyle G. Graham, M.D. (Duke, 1966); Kenneth McCarty, Jr., M.D. (Duke, 1972), Ph.D. (Duke, 1973); George Michalopoulos, M.D. (Athens, 1969), Ph.D. (Wisconsin, 1977); Salvatore Pizzo, M.D. (Duke, 1972), Ph.D. (Duke, 1973); Keith A. Reimer, M.D. (Northwestern, 1972); John D. Shelburne, M.D. (Duke, 1972); Frances King Widmann, M.D. (Case Western Reserve, 1960); Peter Zwadyk, Jr., Ph.D. (Iowa, 1971).

Adjunct Associate Professors: Jacob S. Hanker, Ph.D. (Maryland, 1969); John A. Moore, D.V.M. (Michigan State, 1963); James A. Swenberg, D.V.M. (Minnesota, 1966), Ph.D. (Ohio, 1970).

Assistant Professors: Sandra H. Bigner, M.D. (Tennessee, 1971); Michael M. Borowitz, M.D., Ph.D. (Duke, 1977); Robert H. Christenson, Ph.D. (Florida State, 1980); Raymond E. Ideker, M.D. (Tennessee, 1974), Ph.D. (Tennessee, 1972); Rodney McComb, M.D. (Rochester, 1976); Victor L. Roggli, M.D. (Baylor, 1976); Alfred Sanfilippo, Ph.D. (Duke, 1975), M.D. (Duke, 1976); Frank A. Sedor, Ph.D.

(Florida, 1971); Marcus Simpson, M.D. (North Carolina at Chapel Hill, 1972); Cheryl L. Szpak, M.D. (Southwestern, 1977); Arthur R. Tatum, M.D. (Duke, 1977), Ph.D. (Duke, 1976); John Toffaletti, Ph.D. (North Carolina at Chapel Hill, 1977).

Assistant Clinical Professors: Jane Gaede, M.D. (Duke, 1966); Robin T. Vollmer, M.D. (Duke, 1967).

Assistant Medical Research Professors: Thomas A. Hamilton, Ph.D. (Oregon, 1976); William W. Johnson, Ph.D. (Wisconsin, 1980); Carol W. Lewis, Ph.D. (North Carolina at Chapel Hill, 1972); James G. Lewis, Ph.D. (Duke, 1982); Eileen Mikat, Ph.D. (Duke, 1979).

Adjunct Assistant Professors: Arnold R. Brody, Ph.D. (Colorado, 1969); Donald F. Calbreath, Ph.D. (Ohio, 1968) Jack A. Dean, Ph.D. (Arizona, 1972); Peter Ingram, Ph.D. (Univ. of Southampton, England, 1967); Ralph C. McCoy, M.D. (Emory, 1967); Thiru Vaithianathan, M.D. (Univ. of Ceylon, 1954).

Associates: Patricia Ruth Ashton, A.B. (Goucher, 1963); Kenneth R. Broda, Ph.D. (Duke, 1977); J. E. Phillip Pickett, H.T.; Margaret C. Schmidt, M.A. (Louisville, 1969).

Research Associates: Mary LuSan Hill; Lieselotte Kemper; Patricia L. Berryman.

Required Course

PTH-200. The core course in pathology—is given during the second term of the first year. Fundamentals of pathology are presented by correlating gross and microscopic material to illustrate the structural changes in disease. Lectures dealing with broad concepts of disease processes are presented by senior faculty, and conferences with small groups of students are held under the guidance of staff members. Etiology and pathogenesis of disease, as well as the experimental approach are emphasized for the purpose of correlation with clinical disease. In addition to group work, conferences are scheduled to discuss problems derived from autopsies. Students are required to collaborate in postmortem studies and present cases in clinical-pathologic conferences under the direction of the staff.

Electives

PTH-223(B). Autopsy Pathology. The course is intended to introduce students to the autopsy as an investigative tool; anatomic-clinical correlation is emphasized. Students work directly with one or more members of the Pathology Department. They will first assist at autopsies and then perform autopsies under supervision. They will work up these cases with particular attention to correlations with clinical and experimental medicine, prepare the final autopsy reports on them, and will work essentially at the level of a house officer. Students will be expected to present their findings at staff conferences. If the course is oversubscribed, the students will be chosen by lot. Every term. Weight: 8. *Adams and staff*

PTH-225(B).* Cardiovascular Pathology. Cardiovascular disease processes will be studied, reviewing anatomic, embryologic, and physiologic features, and utilizing case material and gross specimens. Clinicopathologic correlation will be stressed. Term: Fall 1. Weight: 2. *Hackel, Reimer, and Ideker*

PTH-231(B).* Ophthalmic Pathology. This course is designed for students with an interest in ophthalmic diseases and particularly for those planning a career in pathology or ophthalmology, and will consist of lectures, seminars, and laboratory sessions. The normal anatomy and embryology of the eye will be reviewed, and the various reactions of the eye to injury will be studied in gross and microscopic specimens. The more common diseases will be considered in detail. Term: Fall 1. Weight: 3. *Klintworth*

PTH-237(B). Surgical Pathology. This course is designed for the student who wishes more experience in the study of disease. Although the course is entitled *Surgical Pathology*, this does not imply interest solely in the individual oriented to surgery. Problems in dermatology, gynecology, orthopaedics, general surgery, internal medicine, and other specialties will be considered. The program of study will consist of lectures, demonstrations, and laboratory work. Microscope required (limited number available on loan). Term: Spring 2. Weight: 4. *Fetter*

PTH-241(B).* **The Pathologic Basis for Clinical Medicine.** Disease processes will be studied in terms of organ systems, with the intention of enabling students to crystallize the basic processes studied in Pathology 200. Clinicopathologic correlation will be stressed, utilizing gross and microscopic examples of disease processes, case studies, lectures, and demonstrations. This is a survey course and does not treat any one subject in great depth. Term: Fall 1. Weight: 4. *Hackel and staff*

PTH-281(B). **Cytopathology Preceptorship.** This course consists of a full-time rotation by the student in the diagnostic cytopathology laboratories. By working with the laboratory staff, the student will explore in detail the role played by exfoliative cytopathology in the diagnosis of disease. Although not a requirement, the student will be encouraged to pursue special research projects. Every term. Weight: 8. *Johnston, Bossen, Bigner, and staff*

PTH-342(B). **Special Topics in Pathology.** Special problems in pathology will be studied with a member of the senior staff; the subject matter will be individually arranged. Permission of instructor required. Every term. Weight: 1-16. *Jennings and staff*

PTH-346(B).* **Subcellular and Molecular Pathology.** This course is designed for students wishing to broaden their knowledge of cellular structure and cellular pathology. A series of lectures and seminars will be presented on the alterations in cellular structure and associated function that accompany cell injury. Ultrastructural changes in selected human diseases will be discussed in detail with emphasis on diagnosis and pathogenesis. Terms: Fall 1 and 2. Weight: 2. *Jennings, Shelburne, and Sommer*

PTH-348(B). **Practical Surgical Pathology.** This course will be in the form of an apprenticeship in which the student will work closely with the resident in the actual preparation and diagnosis of tissue changes. Microscope required (limited number available on loan). Every term. Weight: 8. *Rossen and staff*

PTH-353(B).* **Neuropathology.** A view of neuropathology that emphasizes clinicopathologic correlation. Term: Fall 1. Weight: 3. *Vogel and staff*

PTH-359(B).* **Fundamentals of Electron Microscopy.** Emphasis will be placed on the theory and application of electron microscopy to ultrastructural pathology. The methods relating to electron microscopy, as well as X-ray microanalysis and ion microscopy, will be considered. Laboratory experience will be included. Terms: Fall 1 and 2. Weight: 3. *Shelburne and Sommer*

PTH-362(B).* **Pathology of the Kidney.** This course is a comprehensive study of pathological, immunological, and clinical features of the various types of glomerulonephritis, nephrotic syndrome, and pyelonephritis, as well as of metabolic, congenital, and neoplastic renal disorders. Lectures will be supplemented with gross and microscopic specimens, demonstrations, clinico-pathological discussions and student seminars. Term: Fall 2. Weight: 3. *Crocker, Sanfilippo, and Jennings*

PTH-364(B). **Skeletal Pathology.** Special problems in skeletal pathology will be dealt with beginning with a discussion of the development of connective tissue. Special emphasis on bone tumors, metabolic diseases, and traumatic problems will be considered. Term: Spring 2. Weight: 2. *Harrelson*

PTH-366(B).* **Pulmonary Pathology and Pathophysiology.** Emphasis will be on pulmonary pathology and pathophysiology of infectious, metabolic, environmental, and neoplastic diseases, and certain diseases of unknown etiology (e.g., sarcoid, alveolar proteinosis, etc.). Term: Fall 2. Weight: 3. *Pratt*

PTH-368(B). **Seminar in Neonatal and Pediatric Pathology.** This is a seminar course covering specific topics in developmental anatomy and major

pathologic processes of the brain, lung, gastrointestinal, and urinary tracts. Emphasis will be on gross, microscopic pathology, and clinicopathologic correlation. These students will assume responsibility for presentations of material in individual seminars. Designed for students entering pathology and clinical pediatrics. Term: Spring 1. Weight: 2. *Bradford*

PTH-371(B). The Laboratory Basis for Clinical Medicine. This course will emphasize evaluation and interpretation of laboratory data relative to pathophysiologic processes. Development of judgment and selectivity in utilizing laboratory tests will be taught. Course will consist of lectures and conferences. Clinicopathologic correlation will be stressed by detailed case studies of specific patients. Term: Spring 2. Weight: 2. *Gaede, Widmann, Pratt, and Zwadyk*

PTH-372(B). Environmental Diseases. The course features guest lecturers and student presentations to cover examples of disease produced by technological exploitation of the earth and "life study." Subjects include population, respiration-air and ocean, and examples of diseases due to asbestos, lead, mercury, hydrocarbons, carcinogens, organic dusts, DDT, cigarette smoke, etc. Term: Spring 1. Weight: 2. *Pratt and Lynn*

PTH-373(B). Diagnostic Immunopathology. The course reviews diagnostic and laboratory procedures used in evaluating immunologic diseases; especially autoimmune, infectious, immunodeficiency, immunoproliferative, and hypersensitivity disorders. Emphasis is placed on the theoretical and practical aspects of testing procedures and their proper interpretation. Term: Summer 2. Weight: 2. *Sanfilippo, Zwadyk, Buckley, and Snyderman*

PTH-374(B).* Pulmonary Structure and Function Seminar. Current and exemplar pathological material on lungs, including gross, histologic, and electron microscopic data, is correlated with *in vitro* function and clinical features; physiological measurements; and roentgenographic findings. The structural features of the types of reaction of lung cells to injury are interpreted against this background. Such demonstration material is correlated by lectures. Every term. Weight: 1. *Pratt, Lynn, and Roggli*

PTH-378(B). Seminars in Hematology. This is a systematic survey of the pathophysiology and morphology of human hematological diseases. Each student will survey the literature on several topics and prepare an oral presentation which will be critically discussed by the group. Opportunity for experience in blood, marrow, and lymph node analysis will be available. Term: Spring 1. Weight: 2. *Wittels*

PTH-380(B). Surgical Pathology with Emphasis on Electron Microscopy. This course will be in the form of an apprenticeship in which the student will become engaged in the actual preparation and diagnosis of tissue changes using both light and electron microscopy. The student will, of necessity, learn how to operate the electron microscope. Every term except Spring 1. Weight: 8. *Shelburne and Vollmer*

PTH-385(B).* Interdisciplinary Seminar in Cancer Research. Emphasis will be on cellular biology of the cancer cell. The instructors will present topics on aspects of cancer research and will attempt to correlate them with the biologic and clinical behavior of specific forms of neoplasia. Terms: Spring 1 and 2. Weight: 4. *Michalopoulos and Falletta*

Pediatrics

Wilburt C. Davison Professor: Samuel L. Katz, M.D. (Harvard, 1952), *Chairman*.

Professors: James B. Sidbury Professor Rebecca H. Buckley, M.D. (North Carolina at Chapel Hill, 1958); Howard Filston, M.D. (Western Reserve, 1962); Thomas E. Frothingham, M.D. (Harvard, 1951);

Herman Grossman, M.D. (Columbia, 1953); Stuart Handwerger, M.D. (Maryland, 1964); Charles R. Roe, M.D. (Duke, 1964); Madison S. Spach, M.D. (Duke, 1954); Alexander Spock, M.D. (Maryland, 1955); Catherine M. Wilfert, M.D. (Harvard, 1962).

Associate Professors: Page A. W. Anderson, M.D. (Duke, 1963); Roger C. Barr, Ph.D. (Duke, 1968); Jane E. Brazy, M.D. (Washington Univ., 1972); John M. Falletta, M.D. (Kansas, 1966); Seymour Grufferman, M.D. (New York at Syracuse, 1964); Laura T. Gutman, M.D. (Stanford, 1963); Lowell King, M.D. (Johns Hopkins, 1956); Donald Kirks, M.D. (Washington Univ., 1968); David R. Merten, M.D. (Cincinnati, 1956).

Assistant Professors: Brenda E. Armstrong, M.D. (St. Louis, 1974); David Auerback, M.D. (Albert Einstein, 1974); William D. Bradford, M.D. (Western Reserve, 1958); Rosalind Coleman, M.D. (Western Reserve, 1969); Jane Donat, M.D. (Albert Einstein, 1972); Peter C. English, M.D., Ph.D. (Duke, 1975); Stephen Gehlbach, M.D. (Western Reserve, 1968); Steven Gross, M.D. (Maryland, 1973); Harold J. Harris, M.D. (Long Island Coll. of Med., Brooklyn, 1949); Andrew Hodson, M.D. (Bristol, England, 1970); J. David Jones, M.D. (Duke, 1954); Sue Y. S. Kimm, M.D. (Yale, 1964); Thomas R. Kinney, M.D. (Duke, 1970); Deborah W. Kredich, M.D. (Michigan, 1962); Darrell V. Lewis, M.D. (Minnesota, 1969); Mary Ann Morris, M.D. (Arkansas, 1972); Shirley K. Osterhout, M.D. (Duke, 1957); M. Henderson Rourk, Jr., M.D. (Pennsylvania, 1963); Hugh Sampson, M.D. (New York at Buffalo, 1975); Richard I. Schiff, M.D., Ph.D. (Duke, 1976); Gerald A. Serwer, M.D. (Duke, 1971); Robert J. Thompson, Jr., Ph.D. (North Dakota, 1971); Rita Vileisis, M.D. (Northwestern, 1975); Kwan-Sa You, Ph.D. (Brandeis, 1971).

Associates: Nancy Friedman, M.D. (Med. Coll. of Virginia, 1975); David L. Fuller, M.D. (Washington Univ., 1973); Sandra Lehrman, M.D. (Brown, 1976); Jerry Oakes, M.D. (Duke, 1972); Mary E. Vernon, M.D. (Columbia, 1976); Gordon Worley, M.D. (Harvard, 1973).

Emeritus: Jay M. Arena, M.D. (Duke, 1932); William Cleland, M.D. (Howard, 1933); Susan C. Dees, M.D. (Johns Hopkins, 1934); Jerome S. Harris, M.D. (Harvard, 1933); Angus M. McBryde, M.D. (Pennsylvania, 1928); Bailey D. Webb, M.D. (Duke, 1946), Ph.D. (North Carolina at Chapel Hill, 1941).

Clinical Professor: William J. A. DeMaria, M.D. (Duke, 1948).

Associate Clinical Professors: William L. London, M.D. (North Carolina at Chapel Hill, 1955); George M. Lyon, Jr., M.D. (Duke, 1961); A. W. Renuart III, M.D. (Duke, 1955); Evelyn Schmidt, M.D. (Duke, 1951).

Assistant Clinical Professors: Clarence Bailey, M.D. (North Carolina at Chapel Hill, 1955); Allen Cato, M.D. (Duke, 1969); James S. Hall, M.D. (Duke, 1957); Alvin H. Hartness, M.D. (Bowman Gray, 1965); Howard H. Loughlin, M.D. (Pennsylvania, 1970); Thomas M. McCutchen, M.D. (Vanderbilt, 1963); Nelle S. Moseley, M.D. (Med. Coll. of Georgia, 1957); Charles B. Neal, M.D. (Duke, 1955); John C. Pollard, M.D. (Virginia, 1968); William C. Powell, M.D. (Bowman Gray, 1952); Jimmie L. Rhyne, M.D. (Maryland, 1948); A. Douglas Rice, M.D. (Duke, 1951); James B. Rouse, M.D. (Duke, 1965); Robert J. Senior, M.D. (Jefferson, 1955); Cornelia Sibrack, M.D. (Michigan, 1972); Frank S. Shaw, M.D. (Pennsylvania, 1959); Charles I. Sheaffer, M.D. (Western Reserve, 1958); S. Winston Singleton, M.B. (Manchester, England, 1952); Fred R. Stowe, M.D. (North Carolina at Chapel Hill, 1958); W. Samuel Yancy, M.D. (Duke, 1965).

Clinical Associates: Lillis Altshuller, M.D. (Cincinnati, 1960); Joanne Barton, M.Sc. (Kentucky, 1974); Mary Jane Burns, M.S.W. (North Carolina at Chapel Hill, 1974); Meade R. Christian, Jr., M.D.



(Western Reserve, 1967); Dennis A. Clements, M.D. (Rochester, 1973); William G. Conley, M.D. (Med. Coll. of Virginia, 1960); Faith B. Crosby, M.D. (South Carolina, 1977); Joanna Dalldorf, M.D. (Cornell, 1958); W. LaDell Douglas, M.D. (Georgetown, 1974); Jean Findlay, M.B. (Aberdeen Univ. Med. Sch. Scotland, 1970); Gregory Fisher, M.D. (South Florida, 1976); Larry C. Harris, M.D. (Duke, 1977); Marcia Herman-Giddens, P.A. (Duke, 1968); Rufus McP. Herring, Jr., M.D. (Bowman Gray, 1969); Jennifer L. Lail, M.D. (Kentucky, 1978); Pierre Le Master, M.D. (Florida, 1971); Brandy McDaniel, M.S.W. (North Carolina at Chapel Hill, 1979); Larry Mumford, M.D. (North Carolina at Chapel Hill, 1967); Susan Quinn-Pierce, M.S.W. (North Carolina at Chapel Hill, 1972); Janice Stratton, M.D. (Tulane, 1961); Joseph Whatley (Duke, 1958); Jerry W. Wiley, M.D. (Duke, 1974).

Research Associates: Janet Barrett, B.S. (East Carolina, 1965); Dianne Y. Bell, Ph.D. (North Carolina State Univ., 1976); William Colmers, Ph.D. (Regensburg, 1980); Marla C. Maile, M.P.H. (Michigan, 1978); Edith Markoff, Ph.D. (California at Santa Cruz, 1980).

Assistant Medical Research Professor: Raymond A. Sturner, M.D. (Georgetown, 1968).

Required Course

PED-205. The basic course in pediatrics for all students—is an eight-week clerkship in the second year. Its principal aim is to provide an exposure to the field of child health. The student has a varying series of experiences which should give a grasp of the concepts that underlie the discipline. Goals should be to acquire familiarity and competence with the basic tools of information-gathering—the history, physical examination, and laboratory data—and to develop an approach to the integration of this material for the solution of problems of health and illness in infancy, childhood, and adolescence. This should be accomplished with continuing reference to the basic principles of pathophysiology encountered in the first year courses.

Those patients to whom the student is assigned will provide the focus for case studies. In addition to the careful history and physical examination which must be recorded, the student is expected to organize an appropriate differential diagnosis and to seek and read pertinent reference material relevant to each patient. The student should learn to present each case verbally in an organized and succinct fashion, to follow the patient's progress, and to interpret all studies which are performed. The student is expected to learn from a number of sources: standard textbooks and journals, current publications and conferences, and also from people—house staff, faculty, nurses, parents, and all others with whom contact is made in the clinical setting.

Objectives should also include an understanding of the roles played in pediatrics by other members of the health care team, both in the ambulatory and hospital settings. Patient care may include nurse, social worker, recreation therapist, psychologist, physiotherapist, dietitian, and/or others. The eight weeks will be divided to include time into several of the following settings: (a) Duke outpatient clinics and emergency room, (b) Duke inpatient, (c) Durham County General Hospital and (d) Duke nurseries.

Electives

PED-210(C). Advanced General Pediatrics. The senior student negotiates the schedule before the beginning of the course. In the general appointment and walk-in clinics, the student may become acquainted with most of the common, primary care pediatric problems as well as causes for referral. Beyond the walls of the hospital, there are opportunities for the student to participate in child health activities in the community in collaboration with a variety of child-serving professionals, including practicing pediatricians, nurse practitioners, public health nurses, teachers, social workers, and mental health workers. Students are encouraged to select an area for in-depth examination, active participation, and the preparation of a report according to their interests, backgrounds, and anticipated career goals. Examples of available areas are behavior-development, rheumatology, child health, and many others. Every term except Summer 2. Weight: up to 8. *General pediatric staff; Dr. Kredich and staff*

PED-211(C). Pediatric Infectious Diseases. This course will provide experience in the clinical and laboratory diagnosis of infectious diseases and in their therapy. The student works closely with the infectious disease fellow and participates actively in evaluation of patients. There is opportunity to gain experience in a laboratory setting (bacteriology, virology). Every term. Weight: 4 or 8. *Wilfert, Frothingham, Gutman, Lehrman, and Katz*

PED-215(C). Endocrine Disorders in Children. Students see clinical endocrine patients by participating in the Pediatric Endocrine Clinics. Stress is placed upon application of hormone assay to the diagnosis of endocrine disorders in childhood. Every term. Weight: 4 or 8. *Handwerger, Morris, and Friedman*

PED-216(C). Interdisciplinary Seminar in Clinical Oncology. Students will be presented with a comprehensive review of clinical oncology, including the epidemiology, pathogenesis, clinical-pathologic correlations, treatment, and prognosis for most human cancers. Relationships between basic science aspects and clinical medicine will be emphasized. Term: Spring 2. Weight: 2. *Falletta and Michalopolous*

PED-217(C). Pediatric Hematology and Oncology. Includes all aspects of clinical and laboratory pediatric hematology, as well as the diagnostic evaluation, care, and treatment of patients with malignant diseases. Emphasis will be placed on fundamental concepts. There will be daily ward rounds, three weekly clinics, conferences and seminars, as well as assigned reading. Students will be encouraged to engage in some individual clinical or laboratory project during the period of the course. Every term. Weight: 4 or 8. *Faletta and Kinney*

PED-221(C). Poison Control. Primarily a seminar course with one two-hour conference per week scheduled for student discussion on assigned topics. The student may participate in clinical functions of the center and if desired may be on call for the treatment of these cases in the emergency room or the ward. This is a student-oriented teaching program and individual projects on the subject may also be carried out. Terms: Fall 1 and 2, Spring 1 and 2. Weight: 2. *Shirley Osterhout*

PED-225(C). Neonatology. Students will have patient care responsibilities and experiences in the nursery service, either Duke North ICN or Duke South nurseries. The course consists of participation in direct patient care under the supervision of the faculty and housestaff. Emphasis is placed on the initiation of parent-child relationships, the assessment of and stabilization of stressed neonates, and the management of neonatal illnesses. Every term. Weight: 4. *Gross, Averbach, and Brazey*

PED-227(C). Behavioral Aspects of Pediatrics. The purpose of this course is to provide training and experience in recognizing and managing the emotional reactions of children and their families to medical and/or psychiatric problems. An integral part of this course will be clinical interviews with the child, parents, and selected family members to determine the impact of medical and psychiatric problems on the development and psychosocial functioning of the child and the total family. Emphasis will be placed on developing skills in child and family interviewing and therapy, crisis intervention, diagnostic evaluations, and appropriate treatment and referral plans. (See also PSC-227.) Every term except Summer 2. Weight: 2-6. *Jones, Fuller, Yancy, Burns, McDaniel, Taub, Winstead, and Quinn-Pierce*

PED-231(C). Clinical Pediatric Cardiology. Provides an intensive learning experience in clinical diagnosis and management of childhood heart disease. Emphasis is placed on the preoperative and postoperative management of children with operable heart disease as well as upon the management of children with nonoperable heart disease. Finally, the student is exposed to pediatric acute care medicine and modalities available to maintain cardiovascular function in the

extremely ill child. Scope: history, physical examination, and special diagnostic techniques (electrocardiography, phonocardiography, echocardiography, cardiac catheterization, and cineangiocardiology). All students are required to meet with one of the instructors prior to enrolling in this course. Every term. Weight: 8, 4 (only with special permission of instructors). *Serwer, Armstrong, and Sterba*

PED-232(C). Preventive Cardiology: Clinical Applications. The aim of this course is to introduce clinical application of the current knowledge in preventive cardiology. The course will consist of didactic sessions and clinical case illustration. Topics will include epidemiology of CAD; CAD risk factor modification, such as clinical management of hyperlipidemias, stress management, physical fitness training; as well as the use of new technologies in early diagnosis of CAD and the current status of bypass surgery, etc. Term: Spring 2. Weight: 1. *Kimm and guest speakers*

PED-233(C). Allergy, Clinical Immunology, and Pulmonary Diseases. Clinical evaluation and practice in use and methods of diagnosis and treatment of allergic disorders, cystic fibrosis, and other pulmonary diseases; immunologic deficiency states; and autoimmune disorders. Scope: history, physical examination, skin and pulmonary function tests, allergen preparation, sweat testing, and a variety of clinical immunologic tests. Every term. Weight: 4 or 8. *R. Buckley, S. Dees, Sampson, Schiff, Rourk, and A. Spock*

PED-239(C). Perinatal Medicine. A study of the relationship of clinical factors during pregnancy, labor, delivery, and the first month of life. Emphasis will be placed on abnormal conditions of pregnancy as related to the infant, prenatal pathological conditions adversely affecting the fetus and newborn, and early management of the infant. Current problems in maternal-fetal relationships will be outlined. The clinical rotation will consist of half time on the high-risk obstetrics service and half on the nursery service (Duke North ICN or Duke South nurseries). (See also OBG-239(C) and PED-225(C).) Every term. Weight: 8. *Perinatal medicine staff*

PED-241(C). Pediatric Nephrology. Course is designed to provide experience in diagnosis, interpretations of laboratory tests, natural history, and treatment of acute and chronic disorders of the kidney in children. Students are also exposed to the management of fluid and electrolyte disorders in infants and children. Every term. Weight: 4 or 8. *Osofsky*

PED-243(C). Adolescent Medicine. Students will see adolescents in youth clinic on Monday afternoons. Emphasis to be placed on the behavioral and developmental aspects of adolescence, drug abuse, and the pregnant teenager. Tutorial and supervisory time to discuss specific patients and pertinent literature will be arranged. Terms: Fall 1 and 2, Spring 1 and 2. Weight: 2. *Yancy*

PED-250(C). Advanced General Pediatrics, Duke North Wards. This advanced course is designed to allow student a four-week experience as a subintern. Under supervision of faculty attendings and resident house staff the senior student will assume primary responsibility for the care of children admitted to the Duke inpatient service. Emphasis will be placed on the development of a pathophysiologic approach to the diagnosis and therapy of a broad spectrum of pediatric illnesses. Advanced concepts in pediatrics will be emphasized. Students will rotate night call with resident pediatric house staff. Term: Spring 1 and 2. Weight: 4. *Armstrong*

PED-281(C). Pediatric Neurology. Students will examine both hospitalized and ambulatory patients with neurological disorders. Emphasis is placed on the neurological history, examination, and the investigation and management techniques of nervous system disorders of childhood. Terms: Fall 1 and 2, Spring 1 and 2. Weight: 8. *Lewis and Kodson*

Pharmacology

Professors: Norman Kirshner, Ph.D. (Pennsylvania State, 1952), *Chairman*; Frederick Bernheim, Ph.D. (Cambridge University, 1928), *J. B. Duke Professor Emeritus*.

Professors: Everett H. Ellinwood, M.D. (North Carolina at Chapel Hill, 1959); Leon Golberg, D.Sc. (Univ. of Witwatersrand, 1946); Leon Lack, Ph.D. (Columbia, 1953); Daniel B. Menzel, Ph.D. (California at Berkeley, 1962); Elliott Mills, Ph.D. (Columbia, 1964); Athos Ottolenghi, M.D. (Univ. of Pavia, 1946); Saul M. Schanberg, M.D. (Yale, 1964), Ph.D. (Yale, 1961); David G. Shand, M.D. (St. Bartholomew's Hospital Med. Coll., London, 1964); Theodore Slotkin, Ph.D. (Rochester, 1970); Pelham Wilder, Ph.D. (Harvard, 1950).

Associate Professors: Mohamed Abou-Donia, Ph.D. (California at Berkeley, 1966); P. Michael Conn, Ph.D. (Baylor, 1976); James Norman Davis, M.D. (Cornell, 1965); Laura E. Gutman, M.D. (Stanford, 1962); Gerald M. Rosen, Ph.D. (Clarkson, 1969); Harold C. Strauss, M.D., C.M. (McGill Univ., 1964); Markku Linnoila, M.D. (Univ. of Helsinki, 1972), Ph.D. (Univ. of Helsinki, 1974).

Assistant Professors: Thorir D. Bjornsson, M.D. (Univ. of Iceland, 1971); James C. Fuchs, M.D. (Johns Hopkins, 1964); Cynthia M. Kuhn, Ph.D. (Duke, 1975); James O. McNamara, M.D. (Michigan, 1968); Julian Victor Nadler, Ph.D. (Yale, 1972); Stephen C. Strom, Ph.D. (Kansas, 1978); A. Richard Whorton, Ph.D. (Vanderbilt, 1975).

Medical Research Associate Professor: Wilkie A. Wilson, Ph.D. (Duke, 1971).

Medical Research Assistant Professors: Jorge Bartolomé, Ph.D. (Univ. of Chile, 1978); Elmer J. Rauckman, Ph.D. (Duke, 1976); Brij Shrivastav, Ph.D. (Univ. of Western Ontario, 1968); Peter G. Smith, Ph.D. (Duke, 1978); Christian Tschanz, M.D. (Univ. of Basle, 1972); Steven P. Wilson, Ph.D. (Duke, 1976).

Adjunct Professors: Pedro Cuatrecasas, M.D. (Washington Univ., 1962); Gertrude Elion, D.Sc. (George Washington, 1969); Robert A. Neal, Ph.D. (Vanderbilt, 1963); Charles A. Nichol, Ph.D. (Wisconsin, 1949); Vladimir Petrow, D.Sc. (Univ. of London, 1947).

Adjunct Associate Professor: Humberto Viveros, M.D. (Univ. of Chile, 1962).

Adjunct Assistant Professors: Joann L. Data, M.D. (Washington Univ. 1970); Robert E. Desjardins, M.D. (Loyola, 1971).

Required Course

PHR-200. Pharmacology: Mode of Action of Drugs. A basic course in pharmacology describing the action of drugs in terms of biochemical and physiological processes, and the rationale for their use in clinical therapy. Four lectures, one clinical correlation and one conference per week. Term: spring. 4 units. *Staff*

Electives

PHR-219(B). Tutorial in Pharmacology. Guided independent study of original literature and/or laboratory experience. Open to all students; required of those electing a preclinical base in the Department of Pharmacology. Every term. Weight: 1-8. *Staff*

PHR-256(B). Human Nutrition. Principles of nutrition related to clinical practice. Emphasis will be placed on the essentials of nutrition using human disease states and maturation (reproduction, growth, and aging) as a basis for instruction. Topics will include nutritional requirements during pregnancy, lactation, infancy, and old age; metabolic disorders and diseased states. A major section will include the use of parenteral nutrition in the treatment of cancer. Term: Fall 1 and 2. Weight: 3. *Manzel*

PHR-270(B).* Also listed as PHS-270(B). Terms: Fall 1 and 2. Weight: 3. *Moore, Kirshner, Robertson, Corless, and Marchase*

PHR-301(B). Physical Chemistry of Aqueous Solutions. An intensive study of the major topics of aqueous solutions including stoichiometry, chemical equilibrium, elementary thermodynamics, experimental kinetics, and electrochemistry. Practical problem sets and problem review sessions will represent a major portion of the course. Term: Summer 1. Weight: 3. *Wilder*

PHR-330(B). Pharmacological Basis of Clinical Medicine. This course consists of a detailed analysis of the mechanism of action and rationale for use of

pharmacologic agents in disease states. Terms: Fall 1 and 2. Weight: 4. *Shand and staff*

PHR-331(B).^{*} Laboratory Methods in Pharmacology. Tutorial laboratory training will be given in various fields of pharmacology, including neuropharmacology, cardiovascular pharmacology, biochemical pharmacology, and biophysical pharmacology. Certain special laboratory sessions will be conducted at the Wellcome Research Laboratories, Research Triangle Park. Every term. Weight: 6. *Staff*

PHR-333(B).^{*} Principles of Pharmacology and Toxicology 1. Drug absorption, distribution, excretion and metabolism, basic and clinical pharmacokinetics, Hansch correlation of structure and activity, stereo-chemistry, and drug action. Terms: Fall 1 and 2. Not offered in 1982. Weight: 3. *Slotkin and staff*

PHR-334(B).^{*} Principles of Pharmacology and Toxicology 2. Drug receptor theory and its practical applications, pharmacokinetics and pharmacodynamics of toxic substances, mechanisms of toxicity, adverse drug reactions and interactions. Terms: Spring 1 and 2. Not offered in 1982. Weight: 3. *Rosen and staff*

PHR-335(B). Cellular Pharmacology. Relation of receptor stimulation, intracellular messengers, and target cell responses. Receptor theory including mathematical development and modeling. Target cell desensitization and supersensitization as well as qualitative evaluation of receptors by biochemical, physiological, and pharmacological criteria is included. Course emphasizes experimental applications in autonomic nervous system and endocrine target cells. Terms: Fall 1 and 2 alternate years beginning 1980. Weight: 3. *Conn, Davis, and Rosen*

PHR-354(B).^{*} Mammalian Toxicology. Principles of toxicology as related to man. Emphasis will be placed on the molecular basis for toxicity of chemical and physical agents. Subjects will include metabolism and pharmacokinetics; toxicologic evaluation; pesticides; metals and industrial chemicals, solvent toxicity, food additives and natural toxics; radiation and radioactive materials; mutagenicity, pathology and toxicology, carcinogenicity, teratogenicity, toxicology of the reproductive system; pulmonary toxicology, toxicology of the kidney, liver toxicology and detoxification mechanisms, neurotoxicology, behavioral toxicology; industrial toxicology, toxicology of the blood, toxicology of the eye, social poisons, management of poisoning, epidemiology, risk assessment, and regulatory toxicology. Offered in alternate years beginning 1981. Weight: 4. *Abou-Donia and staff*

PHR-360(B). Neuropharmacology. Seminar-lecture course emphasizing neuro-transmitter mechanisms and the mechanism of action of drugs used to modify nervous system function. Material will be drawn from the recent literature. Terms: Fall 1 and 2 alternate years beginning 1981. Weight: 3. *Nadler*

PHR-364(B). Neurotoxicology. Adverse effects of drugs and toxicants on the central and peripheral nervous system. Target sites, pathophysiology, and factors affecting toxicity. Experimental methods for detection and screening of neurotoxic chemicals. Screening and assessment of neurotoxicity in people. Terms: Spring 1 and 2 alternate years beginning in 1982. Weight: 3. *Abou-Donia*

PHR-372(B). Research in Pharmacology. Laboratory investigation in various areas of pharmacology. Credit to be arranged. *Staff*

Physiology

Professor: Edward A. Johnson, M.D. (Univ. of Sheffield, 1953), *Chairman*.

Professors: Jacob J. Blum, Ph.D. (Chicago, 1952); Irving T. Diamond, Ph.D. (Chicago, 1953); John W. Gutknecht, Ph.D. (North Carolina at Chapel Hill, 1963); Frans F. Jöbsis, Ph.D. (Michigan, 1958);

Peter K. Lauf, M.D. (Univ. of Freiburg, 1960); Melvyn Lieberman, Ph.D. (State Univ. of New York, 1964); John W. Moore, Ph.D. (Virginia, 1954); Jacqueline A. Reynolds, Ph.D. (Washington Univ., 1963); John V. Salzano, Ph.D. (Iowa, 1956); Knut Schmidt-Nielsen, Dr.Phil. (Copenhagen, 1952); George G. Somjen, M.D. (New Zealand, 1961); Joachim R. Sommer, M.D. (Munich, 1951); Madison S. Spach, M.D. (Duke, 1954); Charles Tanford, Ph.D. (Princeton, 1947).

Associate Professors: Nels C. Anderson, Ph.D. (Purdue, 1964); Peter B. Bennett, Ph.D. (Univ. of Southampton, 1964); Robert P. Erickson, Ph.D. (Brown, 1958); Joseph C. Greenfield, M.D. (Emory, 1956); J. A. Kylstra, M.D. (Leiden, Holland, 1952); Thomas J. McManus, M.D. (Boston, 1955); Lazaro J. Mandel, Ph.D. (Pennsylvania, 1969); Elliott Mills, Ph.D. (Columbia, 1964); George M. Padilla, Ph.D. (California at Los Angeles, 1960); Michael K. Reedy, M.D. (Washington, 1973); David W. Schomberg, Ph.D. (Purdue, 1965); Sidney Simon, Ph.D. (Northwestern, 1973); Myron Wolbarsht, Ph.D. (Johns Hopkins, 1958); William E. Yarger, M.D. (Baylor, 1971).

Assistant Professors: Page A. W. Anderson, M.D. (Duke, 1963); Enrico M. Camporesi, M.D. (Univ. of Milan, Italy, 1970); Marc G. Caron, Ph.D. (Miami, 1973); Vincent W. Dennis, M.D. (Georgetown, 1966); Marc K. Drezner, M.D. (Pittsburgh, 1970); Stuart Handwerger, M.D. (Maryland, 1964); Jeffrey V. May, Ph.D. (Rhode Island, 1979); J. Scott Rankin, M.D. (Tennessee, 1969); Judith L. Swain, M.D. (California at San Diego, 1974); Andrew G. Wallace, M.D. (Duke, 1959); Andrew Wechsler, M.D. (State Univ. of New York, 1964).

Medical Research Associate Professor: J. Mailen Kootsey, Ph.D. (Brown, 1966).

Assistant Medical Research Professors: Norma C. Adragna, Ph.D. (National Univ. of Cordoba, Argentina, 1973); Gilbert Baumann, Dr.Sc. (Swiss Federal Inst. of Tech., 1968); Ping Beall, Ph.D. (Tulane, 1967); Marcia Goldner, Ph.D. (Duke, 1972); Michael Hines, Ph.D. (Chicago, 1975); Peter G. Kaufman, Ph.D. (Chicago, 1971); Avis Sylvia, Ph.D. (North Carolina at Chapel Hill, 1973); Jose Torre-Bueno, Ph.D. (Rockefeller, 1975).

Adjunct Associate Professors: Russell Horres, Ph.D. (Duke, 1975); James M. Schooler, Jr., Ph.D. (Wisconsin, 1964).

Adjunct Assistant Professors: Thomas W. Anderson, Ph.D. (Duke, 1971); Reginald D. Carter, Ph.D. (Bowman Gray, 1970); Michael J. Galvin, Jr., Ph.D. (Georgia, 1975); Philip A. McHale, Ph.D. (Duke, 1975).

Required Course

PHS-200—Introduction to the Physiology of Man. Lectures and conferences on cell and organ physiology. Human and medical aspects are stressed in clinical conferences. The neurophysiology section is given in a three-week period following the end of the semester. Required of first-year medical students; limited to other students whose training requires knowledge of human physiology as it pertains to medicine. Five lectures; one conference, small group discussions. Prerequisite: consent of course leader. Term: fall. 5 units. *Padilla and staff*

Electives

PHS-217(B).^{*} Membrane Transport. Basic principles of the transport of water and solutes across biological and model membranes. The course uses physicochemical principles to provide a comprehensive understanding of phenomena such as active and passive transport, energy barriers through membranes, surface effects, and ion selectivity. The methodology and conceptual framework for the study of transport is described with selected examples from bilayers, red blood cells, nerve and epithelia. Physical chemistry is recommended. Terms: Fall 1 and 2. Weight: 3. *Mandel, Lauf, and Simon*

PHS-219(B). Preceptorship in Physiology. Guided independent study of original literature and/or laboratory experience in physiology. Every term. Weight: 1 to 16. *Staff*

PHS-221(B). The Heart and Peripheral Circulation in Health and Disease. Physiology at the organ systems level, including cardiac electrophysiology and mechanics, arrhythmias, ventricular-atrial function, congenital disordered function, coronary blood flow, and cardiovascular control mechanisms. Offered for graduate school credit. Designed to be most valuable to the medical student as part of a coordinated program of study such as the Cardiovascular Study Program. Terms: Fall 1 and 2. Weight: 2. *Anderson, Greenfield, Spach, Strauss, and Johnson*

PHS-221(B). Respiratory System in Health and Disease. Primary emphasis is on the physiology of respiration. Topics covered include pulmonary mechanics; gas exchange; ventilation-perfusion relationships; central and peripheral regulation of ventilation; and respiratory responses to exercise, altitude, and hyperbaric environments. Terms: Spring 1 and 2. Weight: 2. *Salzano and Kylstra*

PHS-260(B). * Physiology of Cell Growth and Differentiation in Health and Disease. Lectures and discussions based on an extensive literature survey on the regulation of growth and the cell cycle of eukaryotic cells. Emphasis is on the physiological mechanisms which underly cellular proliferation, cell renewal, and the functionality of subcellular organelles in health and disease. Terms: Spring 1 and 2. Weight: 3. *Padilla, Jokoi, Conn, and Vanaman*

PHS-269(B). * Advanced Cell Biology. Structural and functional organization of cells and their components with emphasis on current research problems and prospects. Terms: Fall 1 and 2. Weight: 3. *Endow and staff*

PHS-270(B). * Neurobiology. Interdisciplinary approach to neuronal function at the cellular and molecular levels. Topics will include: subcellular structural organization, physiology and pharmacology of excitable membranes, impulse generation and conduction, neurotransmitters, proteins, pre- and postsynaptic organization and function. Terms: Fall 1 and 2. Weight: 3. *J. W. Moore, Kirshner, Robertson, Corless, and Marchase*

PHS-272(B). * Physiology of the Central Nervous System. Topics include: The central processing of sensory information; motor control, ions, and electric activity in the central nervous system; pathologic changes of function. In part lectures, in part seminar format (reading of original research articles; student presentations). Terms: Spring 1 and 2. Weight: 2. *Somjen*

PHS-320(B). Gastrointestinal Physiology. In this course the normal physiology, mechanisms of control, and transport characteristics of the human gastrointestinal tract and its associated glands (salivary, pancreas, liver) are presented. The mechanisms of secretion and reabsorption are treated at a cellular level. Clinical examples are presented to contrast normal function with pathophysiology. Term: Spring 1. Weight: 2. *Mandel, Akwari, and staff*

PHS-321(B). * Renal Physiology. The composition and size of body fluid compartments and the regulation of the constituents of the plasma by the kidney is presented by lectures. Measurements of renal function including renal blood flow, tubular reabsorption and secretion, and acid-base regulation are discussed together with the theory of counter current exchange, ion transport in the kidney and hormonal control of renal function. Term: Spring 2. Weight: 2. *Dennis, Brazy, Harris, and Mandel*

PHS-383(B). * Physiological Instrumentation. Electronic methods of measurement of physiological variables. The operational amplifier is used as the active building block in appropriate feedback circuits containing only passive elements to make a wide range of linear instruments including analog computers. Digital logic and computing elements are also developed. Terms: Spring 1 and 2. Weight: 3 per 16 weeks. *Moore and staff*

PHS-401(B). * Metabolic Physiology. The control of gluconeogenesis, protein degradation, the storage and mobilization of glycogen and of lipids will be examined both at cellular level (e.g., metabolite compartmentation, futile cycling, enzyme modification) and in terms of interactions between tissues such as liver, kidney, and muscle. Strategies for metabolic adaptation to exercise, cold environment, starvation, obesity, and birth will be discussed. Terms: Fall 1 and 2. Weight: 3. *Blum*



PHS-411(B). Molecular and Cellular Bases of Differentiation. Emphasis is placed on the biochemistry of the cell surface as the basis of cell recognition, control of cell cycle, and overall tissue organization. An analysis of protein nucleic acid interactions in chromosome structure and function are considered in light of new concepts of transcriptional and translational control. Studies also include nuclear cytoplasmic interactions as well as hormone induction of differentiation and development. The course is designed to study the phenomena of development and differentiation and has been organized on a multidisciplinary level. The course is part of the lecture series of development and differentiation study program, DDS-201(B). Terms: Fall 1 and 2. Weight: 3-4. *Padilla, McCarty, Counce, and Kaufman*

PHS-416(B).* Biophysics and Excitable Membranes. Advanced quantitative approach to bioelectric membrane phenomena. Topics include the cable properties

of axons, voltage clamping theory and techniques, the ionic mechanisms of excitation, mechanisms, models of membranes and neurons, and the pharmacology of excitable membranes. Terms: Spring 1 and 2. Weight: 3. *Moore and staff*

PHS-418(B). * Reproductive Biology. An in-depth study of male and female reproductive processes including hypothalamic, pituitary, and gonadal control mechanisms as well as the physiology of pregnancy and parturition. Lectures by guest clinical faculty will emphasize the interface between basic science and clinical aspects. The lecture material in each section of the course is followed by seminar presentations which will contribute to ANA/PHS-424, a corequisite for the course. Also listed as ANA-418(B)*. Terms: Spring 1 and 2. Weight: 2. *Anderson, Schomberg, and Tyrey*

PHS-424(B). Reproductive Biology. Selected topics in reproductive biology will be chosen for in-depth reading and analysis in the seminar format. The seminar is to be taken as a corequisite with ANA/PHS 418. (Also listed as Anatomy 424). Terms: Spring 1 and 2. Weight: 1. *Anderson, Schomberg, and Tyrey*

Psychiatry

Professor: Bernard J. Carroll, B.M., B.S. (Univ. of Melbourne, 1964); Ph.D. (Univ. of Melbourne, 1971), *Chairman*.

DIVISION OF BIOLOGICAL PSYCHIATRY

Professor: William P. Wilson, M.D. (Duke, 1947), *Head of Division*.

Professors: H. Keith H. Brodie, M.D. (Columbia, 1965); Everett H. Ellinwood, Jr., M.D. (North Carolina at Chapel Hill, 1959); C. William Erwin, M.D. (Texas, 1960); Robert L. Green, Jr., M.D. (Hahnemann, 1946); William K. Zung, M.D. (Texas, 1961).

Clinical Professors: John L. Sullivan, M.D. (Johns Hopkins, 1969); Richard J. Wyatt, M.D. (Johns Hopkins, 1964).

Associate Professors: Jonathan Davidson, M.D. (Univ. Coll., London, 1976); Veli Markku Linnoila, M.D., Ph.D. (Helsinki, 1972); Steve Lipper, M.D. (Boston, 1972).

Adjunct Associate Professor: Jau-Shyon Hong, Ph.D. (Kansas, 1973).

Assistant Professor: Richard Weiner, M.D., Ph.D. (Duke, 1973).

Assistant Medical Research Professor: Clinton D. Kilts, Ph.D. (Michigan, 1979).

Clinical Associate: George Dougherty, M.D. (Stanford, 1976).

Research Associate: June Van Bruggen, M.D. (Duke, 1970).

DIVISION OF CHILD AND ADOLESCENT PSYCHIATRY

Professor: John A. Fowler, M.D. (Bowman Gray, 1946), *Head of Division*.

Visiting Research Professor: Robert Coles, M.D. (Columbia, 1954).

Associate Professors: Harold J. Harris, M.D. (Long Island Med. Coll., 1949); J. David Jones, M.D. (Duke, 1954); Charles R. Keith, M.D. (Harvard, 1961).

Assistant Professors: Marcelino Amaya, M.D. (Univ. Nacional Autonoma de Mexico, 1954); William B. Anderson, M.D. (Minnesota, 1948).

Assistant Clinical Professors: Cesar Guajardo, M.D. (Univ. de Nuevo Leon, Mexico, 1961); W. Sam Yancy, M.D. (Duke, 1961).

Associate: David L. Fuller, M.D. (Washington Univ., 1973).

Clinical Associates: Thomas C. Cornwall, M.D. (Northwestern, 1970); Lucy T. Davis, Ed.D. (Columbia, 1955); Barbara H. Denny, M.S.W. (North Carolina at Chapel Hill, 1975); Nancy J. Livingstone, M.D. (Duke, 1972); William Mackey, M.D. (Tennessee, 1969); Daphne Rosenblitt, M.D. (Duke, 1974); Donald L. Rosenblitt, M.D. (Duke, 1973); Jean G. Spaulding, M.D. (Duke, 1972).

Instructor: Alice F. Long, M.A. (Chicago, 1953).

Clinical Instructor: Etta Leathers, M.E. (North Carolina Central, 1974).

DIVISION OF SOCIAL AND COMMUNITY PSYCHIATRY

Associate Professor: Daniel G. Blazer, M.D. (Vanderbilt, 1969), *Head of Division*.

Professors: Kurt Back, Ph.D. (Massachusetts Inst. of Tech., 1949); George L. Maddox, Ph.D. (Michigan, 1956); Frederick T. Melges, M.D. (Columbia, 1961); Erdman B. Palmore, Ph.D. (Columbia, 1959).

Associate Professors: James H. Carter, M.D. (Howard, 1966); Linda K. George, Ph.D. (Duke, 1975); Jacquelyne J. Jackson, Ph.D. (Ohio, 1960); Charles E. Llewellyn, Jr., M.D. (Med. Coll. of Virginia, 1946).

Assistant Professors: Atwood Gaines, Ph.D. (California at Berkeley, 1978); James O. Hoover, M.D. (Iowa, 1966); David Larson, M.D. (Temple, 1973); Kenneth Rockwell, M.D. (Duke, 1961).

Assistant Clinical Professors: Soong Lee, M.D. (Seoul, 1963); Nicholas Stratas, M.D. (Toronto, 1957); Khalil Tanos, M.D. (American Univ., Beirut, 1972);

Associates: Peter Holland, M.D. (South Florida, 1977); Jane Clark Moorman, M.S.W. (Tulane, 1971).

Clinical Associates: Lesley Braasch, M.D. (New York, 1970); Sally Johnson, M.D. (Jefferson, 1976).

Instructors: James W. Osberg, M.D. (Tufts, 1948); Frantz Hershey, M.Ed. (Virginia, 1974); Robert Rollins, M.D. (Duke, 1956); N. P. Zarzar, M.D. (American Univ. of Beirut, 1956).

Clinical Instructor: Mary Lou Melville, M.D. (Texas, 1971).

Research Associates: Gerda Fillenbaum, Ph.D., (London, 1966); Richard Landerman, Ph.D. (Duke, 1978); Margaret Pennybacker, M.A. (North Carolina at Greensboro, 1978); Kathleen Jordan, M.A. (Duke, 1977); Lawrence Wallman, M.A. (Duke, 1976).

DIVISION OF INPATIENT SERVICES

Professor: Frederick R. Hine, M.D. (Yale, 1949), *Head of Division*.

Professor: John M. Rhoads, M.D. (Temple, 1943).

Assistant Professors: Allen Dyer, M.D. (Duke, 1972); Elliott B. Hammett, M.D. (Duke, 1966); Z. Daniel Pauk, M.D. (Iowa, 1956).

Assistant Clinical Professors: Jack W. Bonner III, M.D. (Southwestern, 1965); Christine Machemer, M.D. (Univ. of Freiburg, 1959); Richard O. Poe, M.D. (Harvard, 1958); Cynia B. Shimm, M.D. (Yale, 1950); William Taylor, M.D. (Med. Coll. of Virginia, 1959); Ervin Thompson, M.D. (Vanderbilt, 1972).

Associate in Psychiatric Recreation Therapy: Barbara A. Yoder, M.S. (Florida, 1970).

Clinical Associate: Ernest Raba, M.D. (Texas, 1972).

Clinical Associate Psychiatric Nursing: Patricia Webster, M.S.N. (North Carolina at Chapel Hill, 1976).

Research Associate: Alan J. Stern, Ph.D. (Yale, 1970).

Geropsychiatry

J. P. Gibbons Professor: Ewald W. Busse, M.D. (Washington Univ., 1942).

Professors: Daniel T. Gianturco, M.D. (Buffalo, 1960); Adriaan Verwoerd, M.D. (Med. School of Amsterdam, 1952); Hsio-shan Wang, M.D. (National Taiwan Univ., 1953); Alan D. Whanger, M.D. (Duke, 1956).

DIVISION OF MEDICAL PSYCHOLOGY

Associate Professor: Robert J. Thompson, Ph.D. (North Dakota, 1971), *Head of Division*.

Professors: Irving A. Alexander, Ph.D. (Princeton, 1949); Robert C. Carson, Ph.D. (Northwestern, 1957); Edward Clifford, Ph.D. (Minnesota, 1957); Herbert F. Crovitz, Ph.D. (Duke, 1970);

Adjunct Professor: Florence Kaslow, Ph.D. (Bryn Mawr, 1969).

Associate Professors: Elaine K. Crovitz, Ph.D. (Duke, 1964); Patrick Logue, Ph.D. (North Dakota, 1965); Gail R. Marsh, Ph.D. (Iowa, 1968); Susan Schiffman, Ph.D. (Duke, 1970); Robert Shipley, Ph.D. (Michigan State, 1972); Derek Shows, Ph.D. (Duke, 1967); Ilene Siegler, Ph.D. (Duke, 1974); Richard Surwit, Ph.D. (McGill, 1972).

Adjunct Associate Professor: Lenore Behar, Ph.D. (Duke, 1973).

Visiting Associate Research Professor: Morris Okun, Ph.D. (Pennsylvania State, 1975).

Assistant Professors: James Blumenthal, Ph.D. (Washington, 1975); John Curry, Ph.D. (Catholic Univ., 1978); Mary M. Huse, Ph.D. (Duke, 1959); Francis Keefe, Ph.D. (Ohio, 1975); Albert D. Loro, Jr., Ph.D. (Washington Univ., 1976); Carole S. Orleans, Ph.D. (Maryland, 1977); Anna L. Stout, Ph.D. (South Carolina, 1980); Russell F. Tomlinson, Ph.D. (Florida, 1957); William Varley, Ph.D. (Wisconsin, 1972).

Assistant Clinical Professors: John Barrow, Ph.D. (Houston, 1971); Jack Edinger, Ph.D. (Virginia Commonwealth, 1971); Mark Feinglos, Ph.D. (McGill, 1973); John Lochman, Ph.D. (Connecticut, 1976); Richard A. Lucas, Ph.D. (North Carolina at Chapel Hill, 1972); Belinda Novick, Ph.D. (Michigan State, 1978).

Assistant Medical Research Professors: Ralph Cooper, Ph.D. (Rutgers, 1973); David Madden, Ph.D. (California at Davis, 1977); Pamela Trent, Ph.D. (Northwestern, 1975).

Adjunct Assistant Professors: Brad Fisher, Ph.D. (Alabama, 1976); Sandra Funk, Ph.D. (North Carolina at Chapel Hill, 1976); James A. Green, Ph.D. (North Carolina at Chapel Hill, 1979).

Visiting Assistant Professor: Wayne Watson, Ph.D. (Syracuse, 1977).

Clinical Associates: James E. Byassee, Ph.D. (Louisville, 1975); Charles D. Gasswint, Ph.D. (Oklahoma, 1968); Sabrina Molden, Ph.D. (North Carolina at Chapel Hill, 1981); James W. Osberg, Ph.D. (North Carolina at Chapel Hill, 1978); Thomas Stearns, Ph.D. (Florida State, 1980); Joseph E. Talley, Ph.D. (Virginia, 1977).

Instructor: Joseph Kertesz, M.A. (Michigan, 1973).

Clinical Instructor: Steven Weincrot, Ph.D. (Denver, 1979).

Medical Research Associate: Steven Herman, Ph.D. (Duke, 1977).

Research Associates: Miriam Clifford, Ph.D. (Duke, 1970); James Lane, Ph.D. (Los Angeles, 1979); James McCubbin, Ph.D. (North Carolina at Chapel Hill, 1980); James Moore, Ph.D. (Houston, 1977); Helen Rogers, Ph.D. (North Carolina at Chapel Hill, 1980).

DIVISION OF OUTPATIENT SERVICES

Professor: Jesse O. Cavenar, Jr., M.D. (Arkansas, 1963), *Head of Division*.

Professor: David S. Werman, M.D. (Lausanne, Switzerland, 1952).

Associate Professor: David M. Hawkins, M.D. (Duke, 1966).

Assistant Professors: Ronald Taska, M.D. (Baylor, 1973); John I. Walker, M.D. (Texas at Galveston, 1970).

Assistant Professor of Psychiatric Nursing: Eleanor M. White, M.S. (Oregon, 1963).

Assistant Clinical Professors: Martin G. Groder, M.D. (Columbia, 1964); Leroy B. Lamm, M.D. (Bowman Gray, 1946); Malcolm N. McLeod, M.D. (North Carolina at Chapel Hill, 1965); Robert D. Phillips, M.D. (Pennsylvania, 1952); Karl W. Stevenson, M.D. (Bowman Gray, 1966).

Associate: Steve Mahorney, M.D. (Louisiana, 1973).

Clinical Associates: Ernest R. Braasch, M.D. (State Univ. of New York, 1970); Frank B. Miller, M.D. (Michigan, 1974); Kinsley Weatherly, M.D. (Emory, 1959).

Clinical Instructor: Thomas Stephenson, M.D. (Michigan, 1972).

DIVISION OF PSYCHOSOMATIC MEDICINE

Professor: Jeffrey L. Hout, M.D. (Baylor, 1967), *Head of Division*.

Professors: Joseph B. Parker, Jr., M.D. (Tennessee, 1941); Redford B. Williams, Jr., M.D. (Yale, 1967).

Adjunct Medical Research Professor: Kwen-Jen Chang, Ph.D. (State Univ. of New York, 1972).

Associate Professors: Marianne S. Breslin, M.D. (Medical Academy, Duesseldorf, Germany, 1946); Allan A. Maltbie, M.D. (Emory, 1969).

Assistant Professors: Randal France, M.D. (Texas at Galveston, 1973); James T. Moore, M.D. (Missouri, 1971); Alan Stoudemire, M.D. (North Carolina at Chapel Hill, 1977).

Assistant Clinical Professors: Conrad Fulkerson, M.D. (Missouri, 1969); Patricia A. Ziel, M.D. (Michigan, 1968).

Medical Research Assistant Professor: Patricia Cotanch, Ph.D. (Pittsburgh, 1979).

Associate: Michael Volow, M.D. (Seton Hall, 1964).

Clinical Associates: James Gallagher, M.D. (Stritch, 1974); Bruce Neeley, M.D. (Med. Coll. of South Carolina, 1975); James Weiss, M.D. (Louisiana, 1973); Robert Winton, M.D. (Vanderbilt, 1972).

Instructor: Linda H. Rubin, M.P.H. (North Carolina at Chapel Hill, 1978).

Clinical Instructor: Indira Varia, M.D. (Shah Med. Coll., India, 1968).

DIVISION OF PSYCHIATRIC SOCIAL WORK

Assistant Professor: Martha L. Wertz, M.S.W. (Tulane, 1952), *Head of Division*.

Associates: Hallie M. Coppedge, M.S.W. (North Carolina at Chapel Hill, 1948); Maxine R. Flowers, M.S.W. (Columbia, 1964); Stephen Hawthorne, M.S.W. (California, 1974); Jane Clark Moorman, M.S.W. (Tulane, 1971); Lily P. Wang, M.S.W. (North Carolina at Chapel Hill, 1959).

Clinical Associates: Bess Autry, M.S.W. (North Carolina at Chapel Hill, 1976); Mary A. Black, M.S.W. (North Carolina at Chapel Hill, 1970); Carole Bragdon, M.S.W. (Washington Univ., 1977); Katherine Buckner, M.S.W. (North Carolina at Chapel Hill, 1964); Barbara Denny, M.S.W. (North Carolina at Chapel Hill, 1975); Muki Fairchild, M.S.W. (North Carolina at Chapel Hill, 1976); Glynn Fox, M.S.W. (Louisiana, 1966); William Fraker, M.S.W. (Pennsylvania, 1979); Lisa Gwyther, M.S.W. (Case Western Reserve, 1969); Ann Hamrick, M.S.W. (North Carolina at Chapel Hill, 1965); Constance B. Margolin, M.S.W. (Simmons, 1970); Gail McLeod, M.S.W. (North Carolina at Chapel Hill, 1971); Gail McNeil, M.S.W. (North Carolina at Chapel Hill, 1974); Alice Myers, M.S.W. (North Carolina at Chapel Hill, 1966); Betty B. Parham, M.S.W. (Smith, 1971); Joye Pursell, M.S.W. (North Carolina at Chapel Hill, 1978); Elinor Roy, M.S.W. (North Carolina at Chapel Hill, 1977); Carolyn Thornton, M.S.W. (North Carolina at Chapel Hill, 1968); Margaret Wilner, M.S.W. (Columbia, 1977).

Clinical Instructors: Christine Bell, M.S.W. (North Carolina at Chapel Hill, 1977); Christine Erskine, M.S.W. (North Carolina at Chapel Hill, 1980); William S. Meyer, M.S.W. (Illinois, 1977); Lois

Required Courses

PSC-200. Consists of sixty hours devoted to human behavior. An amphitheater demonstration series introduces the student to the behavioral science issues relevant to medicine. Discussants from the fields of behavioral neurobiology, psychology, psychiatry, and sociology discuss various areas of behavior function from the points of view of the several scientific disciplines. Functional and developmental points of view are presented and stages in the development of the individual personality are traced. Concurrently, a series of small group meetings provide opportunities for additional assimilation of theoretical material and its application with specific examples of behavior through interviews of patients and group discussion. The small groups also provide opportunities to introduce effective techniques of human interviewing and interaction together with observation of the primary data of human behavior. Both didactic and small group portions of the course stress relevance of human behavior to the biological and psychological aspects of medicine.

PSC-205. Required during the second year—is an eight-week clerkship in clinical psychiatry. The student assumes limited responsibility, under supervision, for diagnosis and treatment of patients on the psychiatric wards, psychiatric outpatient clinic, and psychosomatic consultation services on nonpsychiatric wards of the hospital. Supervision is directed toward the application of concepts of diagnosis, psychopathological formulation, and therapy. These concepts are taken from descriptive, biological, psychoanalytic, and psychosocial contributions to current psychiatric thought. Supervision is also provided to develop interpersonal techniques of sensitive observation and therapeutic use of self. Emphasis is placed upon concepts and techniques applicable to all patients as well as psychiatric patients. To this end student interviews with patients on the nonpsychiatric services are reviewed with a psychiatric supervisor. Didactic instruction includes seminars on symptomatic, characterological, and psychophysiological neurotic conditions; the major psychoses; psychiatric problems of childhood; adolescence and late life; drug and somatic therapies; the psychotherapies; and introductory electroencephalography. In addition to rounds and case conferences, students are encouraged to observe psychotherapy and to participate in supervised psychological treatment whenever appropriate situations can be provided.

Electives

PSC-210(B).† Philosophy of Science and Behavioral Sciences. A reading-discussion seminar reviewing the traditional (logical empiricist) view of scientific knowledge and method followed by consideration of recent developments of thought suggesting additions and modifications to that view. Implications for the behavioral sciences in medicine are emphasized. Term: Fall 2. Weight: 1. *Hine and Simpson*

PSC-213(B).† Human Development I: Birth to Adolescence. This course is a survey of the psychological development of the child from birth through adolescence. The first segment of the course is designed to provide the student with an awareness of some of the major theoretical orientations to child development including the psychoanalytic, Piagetian, and social learning positions. This is followed by a systematic study of the normal sequences of child development, focusing in particular on some of the major events in the cognitive, social, and

†For further information, contact the Associate Dean for Graduate Medical Education.

emotional life of the child. The course is run in seminar fashion utilizing numerous theoretical and research papers as well as observation of children in naturalistic settings to facilitate class discussion. Students will also be required to familiarize themselves with research in child development by doing a review of the literature in a defined area. Terms: Fall 1 or Spring 1. Weight: 2. *Curry*

PSC-214(B).† Human Development II: The Later Years of Life. This course will cover the basic research material in the psychology of adult development and aging with an emphasis on such topics as personality development, intellectual development, learning and memory, family and social processes, health and behavior, and research methods. Additionally, the use of research and knowledge base in geriatric medicine and in geriatric psychiatry, with a focus on understanding normal development in mid-life and old age, will be discussed. The course will be taught as a seminar. There will be assigned readings on reserve at the library and a recommended text. Students will be required to review the literature in an area of their choice, prepare an annotated bibliography, and have an oral examination on the topic. Term: Fall 2. Weight: 2. *Siegler*

PSC-215(B).† Comparative Personality Theory. An examination of models of human functioning; topics will include examples from psychoanalytic, interpersonal, humanistic, behavioristic, and existential approaches with the goal of recognizing personality issues that may arise within the framework of the doctor-patient relationship. A paper covering empirical approaches is required. Term: Spring 1. Weight: 1. *Crovitz*

PSC-217(B).† Interpersonal Relationships. Theoretical and empirical models of interpersonal relationships will be examined, with emphasis upon the changing, developmental stages of interpersonal relationships. Research in marital and family systems and in physician-patient dyads will be critically discussed. Terms: Spring 2. Weight: 1. *Lochman*

PSC-223(B).† Neurobiological Basis of Behavior. The course surveys neuroanatomical, neurophysiological, neurochemical, and neuropharmacological evidence of central nervous system function as it relates to normal and abnormal behavior. Clinical description, measurement of function, as well as the biological substrates of affective disorders and psychoses, will be emphasized. Scientific bases of current therapeutic procedures, especially psychopharmacological, will be examined. Course format consists of assigned readings, study questions, lectures by faculty, and other active researchers. Mid-term and final examinations are given. Additionally, students will have an opportunity to become acquainted with and to participate in ongoing research. Terms: Fall 1 and 2. Weight: 4. *Ellinwood, Dougherty, Brodie, Erwin, Grant, Hong, Cooper, Logue, Marsh, Taska, and Wilson*

PSC-238(B).*† Psychophysiology. The first half of the course is devoted to lecture presentations covering the major topics in psychophysiology. The topics receiving a major emphasis are cognition, attention, emotional states, EEG, evoked potentials, skin potential, heart rate, and muscle tension. The second half of the course is devoted to seminar style presentations by the students on topics of their choice and to demonstrations and experiments carried out in the laboratory. A midterm and final exam along with a term paper determine the grade. Terms: Spring 1 and 2. Weight: 3. *Marsh*

PSC-293(B).† Behavioral Medicine. The theory and application of behavior therapy and behavior modification as applied to the treatment of disease will be discussed. The course will focus on the direct behavioral manipulation of pathophysiology, using biofeedback, relaxation and other self-control techniques. Attention will be focused on the treatment of headaches, cardiovascular disorders, neuromuscular disorders, chronic pain, and stress-related gastrointestinal disease.

Both didactic presentation and case material will be used. Students will be expected to spend at least two hours per week seeing patients and rounding with staff. Terms: Summer 1, Fall 1, Spring 1. Weight: 2. *Surwit, Blumenthal, and Keefe*

PSC-297(B). Comparative Health Patterns of American Minorities. Comparison of health attitudes and behaviors of minorities in the United States through literature and experiential review, and a concentration on the impacts of sociocultural and socioeconomic factors on those health patterns. Term: Summer 2, Spring 2. Weight 2-8. *Jackson*

PSC-299(B).† Preceptorship in Neurobiology and/or Behavioral Science. Opportunity for the student to work closely with a member of the faculty in an area of mutual interest, with emphasis upon research. (See biobehavioral study program for partial list of interest areas; more complete descriptions available.) Every term. Weight: 1-8. *Ellinwood and staff*

PSC-303(B).† Developmental Disabilities. The course will focus on several disorders illustrative of the field, such as retardation, autism and learning disabilities as well as broader issues relating to evolving approaches at diagnosis, remediation, and prevention. The objectives are to present what is known about the etiology and course of developmental disabilities as well as an appreciation of management issues. Terms: Fall 2, Spring 2. Weight: 2. *Thompson*

PSC-305(B).† Social and Cultural Aspects of Illness. Seminar on medical-social roles in community and hospital. Topics include physician-patient relationship; epidemiology of illness and health services in terms of ecology, social stratification, race, deviance, and life cycle. Proposals for improving health services are examined. Students prepare and present to the seminar a term paper on a topic of their choice. Students wishing further work in one particular topic such as black sub-culture or gerontology, should take PSC-299(B) specifying particular interest. May be taken in conjunction with PSC-251(C). Term: Spring 1. Weight: 3. *Palmore and Maddox*

PSC-227(C). Behavioral Aspects of Pediatrics. The purpose of this course is to provide training and experience in recognizing and managing the emotional reactions of children and their families to medical and/or psychiatric problems. An integral part of this course will be clinical interviews with the child, parents, and selected family members to determine the impact of medical and psychiatric problems on the development and psychosocial functioning of the child and the total family. Emphasis will be placed on developing skills in child and family interviewing, crisis intervention, diagnostic evaluations, and appropriate treatment and referral plans. (See also PED-227(C).) Terms: Fall 1 and 2, Spring 1 and 2, Summer 1. Weight: 2-6. *Jones, Yancy, Fuller, Burns, McDaniel, Taub, Quinn-Prece, and Winstead*

PSC-234(C). Clinical and Experimental Psychopharmacology. Experience in one or more areas of psychopharmacology including clinical use of drugs, human experimental psychopharmacology and animal neuropharmacology. Lectures covering drug metabolism; mechanisms of action; drug-to-drug interaction; use of animal models for screening psychotropic compounds; animal models of psychosis; neurochemical, behavioral, and electrophysiological effects of drugs during acute and chronic administration; FDA guidelines for conduction of clinical drug trials; biometric approach to ratings of psychopathology; statistical models and computer analysis techniques. Term: Fall 2. Weight: 4. *Zung and Ellinwood*

PSC-240(C). Inpatient Psychiatry. This course is an intensive clinical experience in the diagnosis and treatment of severe and incapacitating psychiatric disorders. The student will be given more clinical responsibility than the comparable second year inpatient rotation. Patient care responsibilities will include

management of ward milieu. Treatment approaches emphasizing psychotherapeutic medication, individual and group psychotherapy will be part of the clinical experience. Participation at selected patient care conferences and didactic lectures is expected. The rotation is available at Duke and the V.A. The rotation at the V.A. will include admission decision-making. This experience can be structured to include a survey of the variety of residential treatment available in this area. If desired a student may arrange for a special reading tutorial in related topics (e.g. schizophrenia). Every term. Weight: 8-6-3. *Cavenar and Pauk*

PSC-241(C). Clinical Management of Psychiatric Inpatients. Students will develop their skills and knowledge in caring for hospitalized psychiatric patients by performing a subinternship role with close faculty supervision. They will learn treatment of major psychiatric illness by taking primary responsibility for approximately eight patients per month. Every term. Weight: 4 or 9. *Poe*

PSC-243(C). Principles and Practice of Outpatient Psychiatry. Training and experience in recognizing and treating emotional disorders in outpatients. Supervised experience with patients having emotional problems commonly seen in medical practice. Training to include theory and techniques of brief psychotherapy, crisis intervention, supportive psychotherapy, and utilization of community resources, both at Duke Hospital and neighboring agencies. The student will be given more clinical responsibility than the comparable second-year outpatient rotation. Because of the nature of outpatient work it is suggested that the student take the longer (8 weeks) rather than the shorter rotation. Terms: Fall 1 and 2, Spring 1 and 2. Weight: 3-8. *Hawkins, Werman, and staff*

PSC-245(C). Psychosomatic Medicine. The consultation-liaison services at the Duke Medical Center and the V.A. Hospital offer clinical clerkships in the psychological management of medical patients. At Duke Hospital, the student does consultations to the various medical and surgical services under the supervision of residents and staff. Emphasis is placed on training the student in interviewing, assessing, and intervening with patients who are depressed, hypochondriacal, responding emotionally to illness, or have conversion symptoms. At the V.A. Hospital opportunities are available to work with selected staff people on the emotional aspects of the disease process through surgical and medical liaison consultations. Students can select specific areas of interest which include emotional aspects of cardiac disease, intensive care, death and dying, orthopaedics, and pain. Terms: Fall 1 and 2, Spring 1 and 2. Weight: 8. *Haupt, Breslin, Blazer, Maltbie, Parker, and Williams*

PSC-251(C). Community Psychiatry and Mental Health. Student will be assigned under supervision to several community or special population settings to experience and learn about population-oriented mental health services. Course details will be worked out with individual student. Terms: Fall 1 and 2, Spring 1 and 2. Weight: 4-8. *Llewellyn, Maddox, Blazer, Carter, Anderson, Harris, and Keith*

PSC-252(C). Christianity, Medicine, and Psychiatry. A clinical training program in which the relationships of Christian insights to the practice of medicine and especially psychological medicine are presented. The course includes attendance at regularly scheduled seminars; individual supervision in the diagnosis, management, and therapy of patients; supervised reading; and a special seminar related to religious psychopathology, as well as the mental health benefits of Christian beliefs. Arrangements must be made with Dr. Wilson before registering for this course. Terms: Fall 1 and 2, Spring 1 and 2. Weight: 4 or 8. *Wilson*

PSC-253(C). Group Psychotherapy. Observation of an on-going outpatient group psychotherapy program. Every term. Weight: 1. *Hawkins and staff*

PSC-255(C). Marriage Counseling in Medical Practice. Basic concepts of the marital relationship and the fundamentals of recognizing, evaluating, and

counseling patients with marital problems will be taught. The orientation will be for the physician delivering primary care. References to the literature will be discussed, and a bibliography will be supplied; community resources for marriage counseling will be described; and students will be expected to present case material for discussion during class sessions. Term: Fall 2. Weight: 1. *Llewellyn and Breslin*

PSC-259(C). Clinical Electroencephalography. This course exposes the student to the various uses of electrophysiologic techniques in psychiatric and neurologic research and diagnostic procedures in addition to monitoring neural function during surgical procedures. Electroencephalography and evoked potential recordings are the primary modalities. The student will participate in didactic instructions, supervised interpretative sessions, and observe surgical monitoring. Every term. Weight: 2. *Erwin, Lewis, and Wilson*

PSC-261(C). Clinical Psychology. The goal of this course is to help the student determine the relevance of psychological factors in the etiology and management of common medical problems. The course will introduce the student to psychological assessment techniques. Students will gain familiarity with the potential utility of these tests in medical practice by both observation and practice in their administration and interpretation. Students who are interested in medical problems such as cognitive impairment, low back pain, headache, or cardiac disease may elect to concentrate their efforts in a specific area. Terms: Fall 1 and 2, Spring 1 and 2. Weight: 1. *Huse and staff*

PSC-265(C). Inpatient Adolescent and Family Psychiatry. Adolescent and family psychopathology are emphasized in the full-time clinical rotation. The experience offered is an intensive and rich one with opportunities to observe and treat patients and their families. Group and individual supervision, collaboration with milieu team members and diagnostic and treatment conferences are heavily emphasized. Every term. Weight: 8. *Miller and Guajardo*

PSC-267(C). Clinical Child Psychiatry. Survey of child and adolescent psychopathology, including diagnostic treatment and consultative approaches. Conferences and seminars augment closely supervised clinical experiences. Terms: Fall 1 and 2, Spring 1 and 2. Weight: 8 or 16. *W. Anderson*

PSC-268(C). Psychosocial Aspects of Medical Illness. Seminars and supervised clinical experiences on the medical wards and clinics will be used to provide the student with knowledge of basic principles and practical clinical skills relevant to determining the role of psychosocial factors in the etiology and course of physical disease in man. This course must be taken in conjunction with a clinical rotation that includes ongoing responsibilities for patient care. Also listed as MED-268(C). Every term. Weight: 2. *Williams*

PSC-273(C). The Ideal Physician. The elective will explore, from the perspectives of history and ethics, the concept of the ideal physician in relation to such figures as Hippocrates, Osler, and others as well as students' and patients' conceptions of what a physician should be, technician and/or humanist. Term: Spring 1. Weight: 1-2. *Dyer and medical history staff*

PSC-274(C). The Ideal Patient. This elective will focus, using the disciplines of history and ethics, on the physician's relationship with the patient and how to deal with patients' expectations of what medicine has to offer. Topics highlighted will include the growth of medical technology, concepts of disease, psychosomatic medicine, and the medicalization of life. Term: Spring 2. Weight: 1-2. *Dyer and medical history staff*

PSC-333 (C). Psychiatry and the Therapeutic Community: Durham County General Hospital. Principles and practice of psychiatric diagnosis and treatment.

Theory of and supervised experience in family therapy, group therapy, and total management of the patient. Active involvement in therapeutic community of the hospital. Every term. Weight: 9. *Melges and Larson*

PSC-335(C). Research Preceptorship in Clinical Psychiatry. This course allows the student to work on a research project in clinical psychiatry with selected members of the psychiatric staff. Terms: Fall 1 and 2, Spring 1 and 2. Weight: 3-8. *Clinical staff by arrangement and Gianturco*

PSC-337(C). Geriatric Psychiatry. The medical and clinical aspects of geriatric psychiatry with emphasis on diagnosis and management of geriatric patients in a variety of treatment facilities. Course includes attendance at scheduled conferences and supervised review of geriatric literature. Course may be taken in conjunction with PSC-214(B). Terms: Fall 1 and 2, Spring 1 and 2. Weight: 3-8. *Verwoerd, Whanger, Blazer, Wang, and staff*

PSC-339(C). Preceptorships in Clinical Psychiatry. An advanced training program in the preceptorship style for the recognition, diagnosis, prognosis, and treatment of psychiatric disorders. Experience will be mainly with inpatients and patients seen in consultation from other services but may include outpatients as well. Terms: Fall 1 and 2, Spring 1 and 2. Weight: 3-8. *Clinical staff by arrangement and Gianturco*

PSC-343(C). Clinical Aspects of Alcohol and Drug Abuse. The purpose of this course is to provide training and experience in recognizing and managing alcoholics and drug abusers. The student will participate in the evaluation and treatment of abusers. Students will also have the opportunity to participate in



alcohol detoxification. The principles and practical management of detoxification of alcoholics will be demonstrated and discussed in depth. Personality characteristics and family interactions of abusers will be emphasized. Abuse is also a social process and the sociocultural milieu will be considered in depth. The student will also be instructed in the neuropharmacology of addicting drugs and alcohol. Students may also have the opportunity to participate in the on-going research of the Behavioral Neuropharmacology Section. Attendance at weekly neuropharmacology seminars is encouraged. Terms: Spring 1 and 2. Weight: 4-8. *Ellinwood, Maddox, Rockwell, and Miller*

PSC-353(C). Correctional-Forensic Psychiatry—Adult and Adolescent. Part-time or full-time experience in a correctional setting is offered. Diagnosis and treatment of adult and adolescent offenders with a variety of medical illnesses and behavioral disturbances are recognized. Elements of forensic psychiatry are stressed where appropriate. Supervision is provided by Duke and University of North Carolina faculty and the Central Prison Hospital and mental health staff. Opportunities for participation in a wide range of original and continuing research are available. Every term. Weight: 2-9. *Carter (Duke), Smith (North Carolina at Chapel Hill), and Rollins (Dorothea Dix)*

PSC-355(C). Clinical Experience in Psychotherapy. This course provides supervised instruction in the long-term care of patients with emotional illness. The student will undertake the psychotherapy of a patient under the direction of a member of the psychiatric faculty. The arrangement with the psychiatric supervisor should be discussed and confirmed with the fourth year clinical departmental professional adviser in psychiatry. Every term. Weight: 1-3. *Gianturco and staff*

PSC-357(C). Behavioral Medicine: Behavioral Treatment of Disease. This course is designed to acquaint the student with behavioral treatment approaches which have proved useful in management of many medical problems. Students will be involved in evaluation and treatment of patients with somatic and psychiatric disorders. Treatment will consist of behavioral modification approaches with particular emphasis on biofeedback. Every term. Weight: 1. *Surwit, Keefe, and Blumenthal*

PSC-365(C). Individual Psychotherapy Based on Psychoanalytic Theory. Seminar concerning the theory and practice of individual psychotherapy involving reading, lecture, and discussion. If possible, on-going discussion of student's cases will be utilized. Students will be encouraged to become involved in therapeutic work with an individual case. Terms: Fall 1 and 2. Weight: 1-2. *Pauk*

PSC-400(C). Geriatric Medicine. This elective is offered by the interdepartmental faculty of the Division of Geriatric Medicine. The student will work with faculty, fellows, and house staff in a number of settings involved in the care of the geriatric patient. These will include the Geriatric Evaluation and Treatment Clinic (Duke), Geriatric Evaluation Unit and Clinic (Veterans Administration Medical Center), geriatric consultation services (Veterans Administration Medical Center, Durham County General Hospital, and Duke), nursing home facilities, interactions with community services (Coordinating Council for Senior Citizens), home assessment, and others. Principles to be stressed will be biology and pathophysiology of aging; multiple clinical problems in the elderly; interdisciplinary team approach to evaluation, planning, and treatment; goals of maximal functional achievement and independence for the elderly. The student will participate actively in the workup and management of patients in both inpatient and outpatient settings as well as become more familiar with the problems of the elderly in the community. Familiarity with the growing literature in geriatric medicine will be encouraged and the student will participate in seminars, lectures, and team meetings at the appropriate sites including the Duke Center for the

Study of Aging. Every term. Weight: 4 or 8. *Cohen, Cohn, Crawford, Friedman, Harrell, Moore, Neish, Simpson, Sullivan, and Warshaw*

Radiology

Professor: Charles E. Putman, M.D. (Texas, 1967), *Chairman*.

DIVISION OF IMAGING

Associate Professor: Carl E. Ravin, M.D. (Cornell, 1968), *Director*.

Professors: James T.T. Chen, M.D. (Nat'l. Defense Med. Ctr., Taiwan, 1950); R. Edward Coleman, M.D. (Washington Univ., 1968); Eric L. Effmann, M.D. (Indiana, 1967); Herman Grossman, M.D. (Columbia, 1953); E. Ralph Heinz, M.D. (Pennsylvania, 1955); Donald R. Kirks, M.D. (Missouri, 1968); Melvyn Korobkin, M.D. (Connecticut, 1967); Reed P. Rice, M.D. (Indiana, 1955); William M. Thompson, M.D. (Pennsylvania, 1969).

Associate Professors: James D. Bowie, M.D. (Oklahoma, 1967); William H. Briner, B.S. (Temple, 1954); Richard H. Daffner, M.D. (Buffalo, 1969); Burton P. Drayer, M.D. (Illinois, 1971); N. Reed Dunnick, M.D. (Cornell, 1969); C. Craig Harris, M.S. (Tennessee, 1951); Ronald Jaszczak, Ph.D. (Florida, 1968); Frederick M. Kelvin, M.D. (Univ. of London, 1966); Salutaris Martinez, M.D. (Havana Univ., 1961); David F. Merten, M.D. (Cincinnati, 1948); Steven R. Mills, M.D. (North Carolina at Chapel Hill, 1972); Dennis R. S. Osborne, M.D. (Univ. of London, 1967); Panol C. Ram, M.D. (India, 1968); Robert H. Wilkinson, Jr., M.D. (Washington Univ. 1958); Joseph P. Workman, M.D. (Maryland, 1946).

Assistant Professors: Collins Baber, M.D. (Duke, 1973); Kerry K. Ford, M.D. (Texas at Galveston, 1976); William Foster, Jr., M.D. (Duke, 1973); David Godwin, M.D. (Stanford, 1971); Robert A. Halvorsen, Jr., M.D. (Miami, 1974); Donald Johnson, M.D. (West Virginia, 1974); Arl Van Moore, M.D. (Arkansas, 1974); Pamela Nelson, M.D. (North Carolina at Chapel Hill 1977); LeRoy Roberts, M.D. (Temple, 1975); Eric R. Rosenberg, M.D. (New York Med. Coll., 1975); Paul Silverman, M.D. (Massachusetts, 1977); Daniel C. Sullivan, M.D. (Vermont, 1970); Margaret E. Williford, M.D. (Duke, 1976); Andrew Yeates, M.D. (Northwestern, 1977).

Associates: Jerry S. Apple, M.D. (Duke, 1978); C. Roger Bird, M.D. (Loma Linda, 1977); Elizabeth Blackburn, M.D. (Virginia Commonwealth, 1972); Simon D. Braun, M.D. (Emory, 1977); Nicholas Frankel, M.D. (Med. Coll. of Virginia, 1975); Maroon B. Khoury, M.D. (American Univ. of Beirut, 1979); David Ling, M.D. (Duke, 1977); George A. Miller Jr., M.D. (Cornell, 1977); Glenn E. Newman, M.D. (Duke, 1973); Robert F. Rauch II, M.D. (Case Western Reserve, 1978); David S. Warner, M.D. (Northwestern, 1978).

Research Associates: W. Milton Bates, R.T. (Vanderbilt, 1973); Lawrence W. Hedlund, Ph.D. (Pittsburgh, 1968).

DIVISION OF RADIATION BIOLOGY

Professor: Aaron P. Sanders, Ph.D. (North Carolina at Chapel Hill, 1964), *Director*.

Associate Professor: William D. Currie, Ph.D. (North Carolina at Chapel Hill, 1964).

Assistant Professors: Randy L. Jirtle, Ph.D. (Wisconsin, 1975); Raymond U, Ph.D. (Kyoto, Japan, 1970).

DIVISION OF RADIATION PHYSICS

Professor: Fearghus O'Foghluha, Ph.D. (Nat'l. Univ. of Ireland, 1961), *Director*.

Assistant Professors: Mark J. Engler Ph.D. (Mass. Inst. of Tech., 1969); G. Allen Johnson, Ph.D. (Duke, 1974); Daniel Miller, Ph.D. (North Carolina State, 1971); Charles E. Nelson, Ph.D. (Ohio, 1973).

Research Associate: James W. Blackburn.

Associate: Conrad Knight.

DIVISION OF RADIATION THERAPY

Professor: Leonard Prosnitz, M.D. (State Univ. of New York, 1961), *Director*,

Assistant Professor: Elmer R. Cano, M.D. (Nat. Univ. at Trujillo, Peru, 1971); K.T. Noell, M.D. (Rochester, 1967).

Associate Professor: Boyd T. Worde, M.D. (Tennessee, 1947).

Required Course

RAD-200. The basic course in radiology for all medical students is combined with physical diagnosis and laboratory diagnosis into IND-200. The course is a

concentrated lecture series with correlating demonstration laboratories designed to provide a broad introductory exposure to the entire field of diagnostic radiology.

Electives

RAD-221(B). General Physics of Radiology. Basic physics underlying radiation diagnosis and therapy, emphasizing production and measurement of ionizing radiation and radiation interactions in tissue; physical rationale of radiation methods in clinical practice; survey of recent developments in radiological equipment; radiation hazards. Terms: Fall 2, Spring 1. Weight: 2. *O'Foghlu*

RAD-223(B). Radioisotope Methods and Techniques in Biomedical Research. Introduction to principles and practices in biomedical research applications of radioactive materials: fundamentals of radioactivity, nuclear instrumentation, counting methodology, statistics of counting, liquid scintillation counting, external standard ratio, sample preparation. This course will be helpful for those seeking state or federal licenses for biomedical research uses of radioactive materials. Term: Spring 1. Weight: 2. *Sanders, O'Foghlu, McCrea, Currie, and Knight*

RAD-227(B). General Radiobiology. Basic fundamentals essential to an understanding of biological effects of ionizing radiation. Major sections include radiation physics, radiation dosimetry, target theory, and activated water theory in radiation damage, oxygen effect, radiobiology, subcellular effects, tissue radiosensitivity, general radiation syndrome. Term: Spring 1. Weight: 2. *Sanders, Currie, and Jirtle*

RAD-231(B). Introduction to Radiological Sciences. Basic principles underlying radiography, contrast materials, ultrasound, nuclear medicine, computerized tomography, and nuclear magnetic resonance will be presented. A thorough review of radiographic anatomy will precede an organ-system approach to radiologic-pathologic correlation. Lectures will be supplemented with demonstrations. Term: Fall 1. Weight: 3. *Effmann, Thompson, and Putman*

RAD-250(B). Research in Radiology. An individually arranged experience in which the student identifies with and participates in an established research program of a faculty member. Program should be arranged with DPA and proposed faculty member well in advance of starting date. Every term. Weight: 1-8. *Effmann, Thompson, and Putman*

RAD-210(C). Pediatric Radiology. A specialized program of instruction and participation in the wide variety of radiographic examinations in the pediatric age group. Special correlation of these examinations to the problems of specific diagnosis and patient care will be made. Students must contact Dr. Grossman prior to registration. Every term. Weight: 4-8. *Grossman and staff*

RAD-211(C). Clerkship in Neuroradiology. A specialized program of detailed instruction in neuroradiology. The program includes participation in the performance and interpretation of a variety of examinations including cerebral angiography, pneumoencephalography, computerized axial tomography, myelography, cisternography, and others. Students must contact Dr. Drayer prior to registration. Every term. Weight: 4. *Drayer, Heinz, Yates, and Osborne*

RAD-215(C). Clinical Radiation Oncology. Half of all cancer patients require radiation therapy of curative or palliative intent at some point in their care. This course provides clinical experience in evaluation, treatment, and follow-up of patients treated in the Division of Radiation Oncology. The course is particularly directed to students with career goals in medical, radiation, or surgical oncology. Students must contact Dr. Noell prior to registration. Every term. Weight: 4-8. *Noell and staff*

RAD-229(C). Basic Radiology Clerkship. This is designed to provide a broad exposure to varied aspects of diagnostic radiology. The elective consists of: (a) an informal lecture course, supplemented by student presentations; (b) weekly rotations observing the performance and discussing the interpretation of radiographic procedures; (c) use of an extensive teaching file of radiographs; (d) viewing a series of audiovisual tapes. One week is spent on the chest rotation, the other rotations are at the individual students' discretion, and may include GI, GU, bone, neuro, pediatrics, vascular, nuclear medicine, body computed tomography or ultrasonography. Rotations to the V.A. radiology department may also be arranged. All registrants will meet with Dr. Kelvin the morning of the first day of the course to discuss their individual rotations. Every term. Weight: 6. *Kelvin and staff*

Surgery

James B. Duke Professor: David C. Sabiston, Jr., M.D. (Johns Hopkins, 1947), *Chairman*.

DIVISIONS OF GENERAL AND CARDIO-THORACIC SURGERY

Professors: D. Bernard Amos, M.D. (Guys Hospital, London, 1963), Experimental Surgery; William G. Anlyan, M.D. (Yale, 1949); Dani P. Bolognesi, Ph.D. (Duke, 1964), Experimental Surgery; Eugene D. Day, Ph.D. (Delaware, 1952), Experimental Surgery; Howard C. Filston, M.D. (Western Reserve, 1962); James C. A. Fuchs, M.D. (Johns Hopkins, 1964); Robert H. Jones, M.D. (Johns Hopkins, 1965); Joseph A. Moylan, Jr., M.D. (Boston, 1964); H. Newland Oldham, Jr., M.D. (Baylor, 1961); William P. J. Peete, M.D. (Harvard, 1947); Raymond W. Postlethwait, M.D. (Duke, 1937); William W. Shingleton, M.D. (Bowman Gray, 1943); Hilliard F. Seigler, M.D. (North Carolina at Chapel Hill, 1960); Delford L. Stickel, M.D. (Duke, 1953); Andrew S. Wechsler, M.D. (State Univ. of New York, 1964); Walter G. Wolfe, M.D. (Temple, 1963); W. Glenn Young, Jr., M.D. (Duke, 1948).

Clinical Professor: Timothy Takaro, M.D. (New York Univ., 1943).

Associate Professors: Onyekwere Akwari, M.D. (Southern California, 1970); Darel D. Bigner, M.D. (Duke, 1965), Ph.D. (Duke, 1971), Experimental Surgery; Jeffrey J. Collins, Ph.D. (Harvard, 1972), Experimental Surgery; Jim L. Cox, M.D. (Tennessee, 1967); Wirt W. Smith, M.D. (Texas, 1951), Experimental Surgery.

Associate Medical Research Professor: Per-Otto F. Hagen, F.H.W.C. (Watt University, Edinburgh, Scotland, 1961), Experimental Surgery; Alphonse J. Langlois, Ph.D. (Duke, 1966), Experimental Surgery.

Associate Clinical Professors: James E. Davis, M.D. (Pennsylvania, 1943); Stewart M. Scott, M.D. (Baylor, 1951); Gulshan K. Sethi, M.D. (All India, 1963).

Assistant Professors: Ralph R. Bollinger, M.D. (Tulane, 1970); Gregory S. Georgiade, M.D. (Duke, 1973); John P. Grant, M.D. (Chicago, 1969); George S. Leight, Jr., M.D. (Duke, 1972); James E. Lowe, M.D. (California at Los Angeles, 1973); Philip D. Lumb, M.B.B.S. (London Univ. School of Med., 1974); William C. Meyers, M.D. (Columbia, 1975); J. Scott Rankin, M.D. (Tennessee, 1969); Alfred Sanfilippo, M.D. Ph.D. (Duke, 1975), (Duke, 1976), Experimental Surgery; Gary Stuhlmiller, Ph.D. (Duke, 1976), Experimental Surgery; Frances F. Ward, Ph.D. (Brown, 1965), Experimental Surgery.

Assistant Medical Research Professors: John O. Cambier, Ph.D. (Iowa, 1975); Barbara Kitchell, Ph.D. (Duke, 1974); Thomas J. Matthews, Ph.D. (Missouri, 1971); Elmer J. Rauckman, Ph.D. (Duke, 1975); Kent J. Weinhold, Ph.D. (Pennsylvania, 1979).

Assistant Clinical Professors: Larry M. Bragg, M.D. (Texas, 1976); Albert H. Bridgman, M.D. (Louisiana, 1956); Rollins S. Burhans, Jr., M.D. (Louisville, 1963); Gordon M. Carver, M.D. (Duke, 1948); John M. Cheek, Jr., M.D. (Bowman Gray, 1945); John T. Daniels, M.D. (Howard, 1964); Thomas L. English, M.D. (Duke, 1969); Thomas J. Enright, M.D. (Buffalo, 1948); Walter J. Loehr, M.D. (Cornell, 1963); James G. Leuhrs, M.D. (Washington, 1960); F. Maxton Mauney, Jr., M.D. (Duke, 1959); W. B. McCutcheon, Jr., M.D. (Virginia, 1952); Amir A. Neshat, M.D. (Isfahan University, Iran, 1960); E. Wilson Staub, M.D. (Northwestern, 1957); Douglas H. Stone, M.D. (Harvard, 1937); David W. Vaughn, B.S. (New York State Univ., 1978); Charles D. Watts, M.D. (Howard, 1943); David K. Wellman, M.D. (Duke, 1971).

Clinical Associates: Ray A. Ashcraft, B.S. (North Texas State, 1958), D.D.S. (Baylor, 1963), Dentistry; Thomas A. Ferretti, D.D.S. (North Carolina at Chapel Hill, 1976), Dentistry; Robert N. Hunter, D.D.S. (North Carolina at Chapel Hill, 1977), Dentistry; James T. White, D.D.S. (Loyola, 1966), M.S. (North Carolina at Chapel Hill, 1976), Dentistry; Douglas B. Young, M.D. (North Carolina at Chapel Hill, 1974).

Medical Research Associate: Paul Hendrix, B.S. (Coll. of Charleston, 1970), B.H.S. (Duke, 1975).

Research Associates: Luis A. Cantarero, Ph.D. (Iowa, 1980); Timothy Darrow, Ph.D. (State Univ. of New York, 1980); James W. Davis, M.S.E.E. (Duke, 1974); Gudrun Huper, M.A. (Stuttgart,

Germany); Anthony V. Seaber; George Konstantinow, Jr., Ph.D. (North Carolina at Chapel Hill, 1980); Juliet S. Melzer, M.D. (Illinois, 1974).

DIVISION OF NEUROSURGERY

Professor: Robert H. Wilkins, M.D. (Pittsburgh, 1959), *Chief*.

Professor: Blaine S. Nashold, M.D. (Louisville, 1949).

Associate Professor: Wesley A. Cook, Jr., M.D. (Oregon, 1963).

Assistant Professors: Dennis E. Bullard, M.D. (St. Louis, 1975); Allan H. Friedman, M.D. (Illinois, 1974); W. Jerry Oakes, M.D. (Duke, 1972); Bruno J. Urban, M.D. (Germany, 1960).

Assistant Clinical Professors: Bruce L. Kihlstrom, M.D. (North Carolina at Chapel Hill, 1972); Walter S. Lockhart, M.D. (Bowman Gray, 1944); Robert E. Price, Jr., M.D. (North Carolina at Chapel Hill, 1964).

Associates: Carlos U. Arancibia, M.D. (Univ. of Chile, 1969); Richard S. Kramer, M.D. (Duke, 1962).

Research Associates: Janice O. Levitt, Ph.D. (Temple, 1963); Robert D. Pearlstein, M.S. (North Carolina at Chapel Hill, 1978).

DIVISION OF ORAL SURGERY

Professor: Nicholas G. Georgiade, D.D.S., M.D. (Duke, 1949), *Chief*.

Associate Professor: John C. Angelillo, D.D.S., M.D. (Duke, 1970).

Assistant Professor: Edward A. Dolan, D.D.S. (Maryland, 1971).

DIVISION OF ORTHOPAEDIC SURGERY

James B. Duke Professor: J. Leonard Goldner, M.D. (Nebraska, 1943), *Chief*.

Professors: Frank H. Bassett III, M.D. (Louisville, 1957); Frank W. Clippinger, M.D. (Washington, 1952); Donald E. McCollum, M.D. (Bowman Gray, 1953); James R. Urbaniak, M.D. (Duke, 1962).

Associate Clinical Professors: Everett I. Bugg, Jr., M.D. (Johns Hopkins, 1937); Ralph W. Coonrad, M.D. (Duke, 1947); John Glasson, M.D. (Cornell, 1943); Frank H. Stelling III, M.D. (Georgia, 1938).

Assistant Professors: Robert D. Fitch, M.D. (Duke, 1976); William E. Garrett, M.D. (Duke, 1976); Richard D. Goldner, M.D. (Duke, 1974); William T. Hardaker, M.D. (Duke, 1973); John M. Harrelson, M.D. (Duke, 1964); James A. Nunley II, M.D. (Tulane, 1973).

Assistant Clinical Professors: William J. Callison, M.D. (Vanderbilt, 1953); J. Lawrence Frank, M.D. (Duke, 1965); J. George Jonas, M.D. (Zurich, 1954); Stephen N. Lang, M.D. (Illinois, 1965); C. Robert Lincoln, M.D. (Med. Coll. of Virginia, 1960); Angus M. McBryde, Jr., M.D. (Duke, 1963); William S. Ogden, M.D. (Med. Coll. of Georgia, 1965); Edwin T. Preston, Jr. M.D. (Duke, 1960); Eugene L. Zorn, M.D. (New York Med. Coll., 1941).

Adjunct Assistant Professor: Marcia M. Goldner, Ph.D. (Duke, 1972).

Clinical Associates: Richard F. Bruch, M.D. (Illinois, 1972); Albert T. Jennette, M.D. (North Carolina at Chapel Hill, 1959); Leslie C. Meyer, M.D. (Nebraska, 1943); Ronald A. Pruitt, M.D. (Med. Coll. of Virginia, 1959).

DIVISION OF OTOLARYNGOLOGY

Professor: William R. Hudson, M.D. (Bowman Gray, 1951), *Chief*.

Associate Professors: T. Boyce Cole, M.D. (North Carolina at Chapel Hill, 1962); Joseph C. Farmer, Jr., M.D. (Duke, 1962); Patrick D. Kenan, M.D. (Duke, 1959).

Associate Medical Research Professor: John H. Casseday, Ph.D. (Indiana, 1970).

Associate Clinical Professor: Carl M. Patterson, M.D. (Maryland, 1944).

Assistant Professor: Samuel R. Fisher, M.D. (Duke, 1975).

Assistant Clinical Professors: James W. Brown, Jr., M.D. (Duke, 1941); Charles E. Clark III, M.D. (Michigan, 1968); Seth G. Hobart, Jr., M.D. (Virginia, 1950); Lynn A. Hughes, M.D. (Oklahoma, 1968); C. Emery Williams, M.D. (Louisiana State, 1963).

Clinical Associates: Peter G. Chikes, M.D. (North Carolina at Chapel Hill, 1972); Edward V. Hudson, M.D. (Bowman Gray, 1962); William B. Inabnet, M.D. (Louisiana, 1958); Charles H. Mann, M.D. (West Virginia, 1966); Thaddeus H. Pope, Jr., M.D. (North Carolina at Chapel Hill, 1957).

Research Associate: Ellen Covey, Ph.D. (Duke, 1980).

DIVISION OF PLASTIC AND MAXILLOFACIAL SURGERY

Professor: Nicholas G. Georgiade, D.D.S., M.D. (Duke, 1949), *Chief*.

Professors: Edward Clifford, Ph.D. (Minnesota, 1954); Galen W. Quinn, D.D.S. (Creighton, 1952), Orthodontics; Donald Serafin, M.D. (Duke, 1964).

Associate Professors: John C. Angelillo, D.D.S. (Duke, 1970); Robert M. Mason, D.M.D. (Kentucky, 1977), M.S.O. (North Carolina at Chapel Hill, 1979), Orthodontics.
Associate Clinical Professor: George F. Crikelair, M.D. (Wisconsin, 1944).
Assistant Professors: William J. Barwick, M.D. (Tennessee, 1971); Ronald Riefkohl, M.D. (Tulane, 1972).
Assistant Clinical Professor: Verne C. Lanier, Jr., M.D. (Vanderbilt, 1966).
Research Associate: Ruth S. Georgiade, M.A. (Duke, 1950).

DIVISION OF UROLOGIC SURGERY

Professor: David F. Paulson, M.D. (Duke, 1964), *Chief*.
Professors: E. Everett Anderson, M.D. (Duke, 1958); Lowell R. King, M.D. (Johns Hopkins, 1956).
Associate Professors: Robert A. Bonar, Ph.D. (California at Berkeley, 1953), Biophysics; John L. Weiner, M.D. (Harvard, 1967).
Associate Clinical Professors: John H. Grimes, M.D. (Northwestern, 1965); Jack Hughes, M.D. (Pennsylvania, 1943).
Assistant Professors: Culley C. Carson III, M.D. (George Washington, 1971); Elaine K. Crovitz, Ph.D. (Duke, 1968); Philip J. Walther, M.D. (Duke, 1975); George S. Webster, M.B., Ch.B. (Univ. Coll. of Rhodesia, 1968).
Assistant Medical Research Professors: John W. Day, Ph.D. (Iowa, 1972); Robert W. Green, Ph.D. (Hawaii, 1969); Yousuf Sharief, Ph.D. (North Carolina State Univ., 1973); Joy L. Ware, Ph.D. (North Carolina at Chapel Hill, 1979); Karen S. Webb, Ph.D. (North Carolina at Chapel Hill, 1973).
Assistant Clinical Professors: A. James Coppridge, M.D. (Virginia, 1953); Alvin D. Couch, M.D. (South Carolina, 1948); Joyce D. Coughlin, M.D. (Buffalo, 1944); Hector H. Henry II, M.D. (Tulane, 1965); Robert A. Older, M.D. (Duke, 1968); Edwin M. Tomlin, M.D. (Tennessee, 1946).
Associate: Steven H. Herman, Ph.D. (Duke, 1977).
Clinical Associates: James A. Bergant, M.D. (Kansas, 1969); Alexander Maitland III, M.D. (Yale, 1955); Randall B. Vanderbeek, M.D. (Duke, 1963).
Clinical Instructors: Oscar W. Brazil, Jr., M.D. (Louisiana, 1961); Raymond E. Joyner, M.D. (Bowman Gray, 1968).
Clinical Research Associate: Dannie H. King, Ph.D. (North Carolina State, 1973).

PROGRAM IN HEARING AND SPEECH DISORDERS

Professor: LuVern H. Kunze, Ph.D. (Iowa, 1962), *Director*.
Associate Professor: Bruce A. Weber, Ph.D. (Illinois, 1966).
Assistant Professors: Jennifer Horner, Ph.D. (Florida, 1977); John E. Riski, Ph.D. (Florida, 1976).
Associates: Burton B. King, M.A. (Northwestern, 1955); Robert G. Paul, Ph.D. (Oklahoma, 1969).
Instructor: Barbara G. Saunders, M.A. (Tennessee, 1974).

Required Course

SUR-205. The required course in surgery, is given in the second year and consists of an eight week clinical clerkship. The primary goal is the presentation of those concepts and principles which characterize the discipline of surgery. The fundamental features which form the foundation of surgical practice are presented at seminars three times weekly. The subjects discussed include antisepsis, surgical bacteriology, wound healing, inflammation, fluid and electrolyte balance, shock, the metabolic response to trauma, biology of neoplastic disease, gastrointestinal physiology and its derangements, and blood coagulation, thrombosis, and embolism.

The students are divided into two groups, one at Duke and the other at the V.A. Hospital, and each works with two members of the surgical faculty. Students are assigned patients on the surgical wards for diagnosis and management, and clinical rounds are made three times weekly with the faculty. A full-time teaching resident is assigned for the course in order to provide the students with continuous and readily available instruction at all times. A one hour session is devoted daily to demonstrations by the surgical specialties including neurosurgery, orthopaedics, otolaryngology, plastic surgery, and urology. The students attend a weekly session in experimental surgery, during which each student serves in rotation as the anesthesiologist, first assistant, and operating surgeon in performance of surgical procedures on experimental animals.

Electives

SUR-219(C). Advanced General and Thoracic Surgery (VA Hospital). The student will function as a subintern in surgery. Special attention will be given to those subjects in surgery common to all medical practices. Patients will be assigned to the students who will assume primary responsibility for their care under the supervision of the faculty and residents. The major emphasis will be on physiologic and pathologic changes, diagnosis, indications for operation, and observation of surgical procedures. Every term. Weight: 8. *Postlethwait, Fuchs, Seigler, Stickel, Wechsler, Akwari, Cox, Lowe, and Grant*

SUR-221(C). Surgical Specialties and Ophthalmology (V.A. Hospital). The student will attend selected conferences of all the surgical specialties and ophthalmology. Additionally, the student will select two or three of these specialties in which to concentrate experience (on one service at a time) in the operating rooms, clinics, and wards of the V.A. Hospital. Pathophysiology, diagnosis, and treatment will be emphasized. Every term. Weight: 8. *Fuchs, Walther, McCuen, Fisher, Friedman, Harrelson, and Barwick*

SUR-222(C). Clinical Dentistry. Normal and abnormal development of head, face, jaws, and oral structures. Importance of teeth for mastication, speech, deglutition, growth and development, esthetics, general health, and for treatment of congenital and acquired abnormalities of the cranium, face, and jaws. Examination, diagnosis, and treatment of pediatric to geriatric oral dental disease. Orthodontic, surgical, and/or orthodontic-surgical management of orodentofacial problems. Every term. Weight: 1. *Quinn and Angelillo*

SUR-227(C). Advanced Urologic Clerkship. The diagnosis, management, and surgical treatment of patients with urologic disorders will be stressed. Students will be afforded intimate association with the entire staff in the clinics, wards, and operating rooms and will participate in surgery. Cystoscopic and urographic diagnostic methods along with other techniques will be taught. Every term. Weight: 8. *Anderson, Paulson, King, Weinerth, Webster, Carson, Walther, and Dunnick*

SUR-228(C). Clerkship in Pediatric Urology. Designed to give an overview of urologic problems in the pediatric population. Will include patient contact and seminar material as well as ward and operating room experience in the diagnosis, treatment, and long-term followup of children with urologic disease. Every term. Weight: 4. *King*

SUR-230(C). Seminar in Urologic Diseases and Techniques. Lecture-seminar course by members of the staff in urology and radiology, providing an introduction to the spectrum of urologic diseases, amplified by demonstration of urologic and radiologic diagnostic methodology. Clinical problems to be stressed include endocrinopathies, pediatric urology, obstructive uropathies, renovascular hypertension, urinary calculi, and urologic malignancies. Informal seminars given weekly. Every term. Weight: 8. *Anderson, Paulson, King, Weinerth, Webster, Carson, Walther, and Dunnick*

SUR-233(C). Basic Neurosurgery Course. Disease conditions commonly encountered in neurosurgery are presented. Clinical presentation of a disorder, such as brain tumor or head injury, is made by a member of the staff. Clinical features and plan of diagnostic investigation are stressed. The clinical disorder is used as a focal point from which to carry the presentation into the basic sciences are related to the clinical problem. Terms: Fall 1 and 2, Spring 1 and 2. Weight: 1. *Cook, Wilkins, Kramer, Oakes, and Friedman*

SUR-234(C). Pediatric Neurosurgery. Survey of the major neurosurgical topics encountered in the pediatric age group. Emphasis will be given to the

demonstration of clinical findings, necessary radiographic evaluation and therapeutic alternatives in selected disease processes. Terms: Fall 1 and 2, Spring 1 and 2. Weight: 1. *Oakes and Wilkins*

SUR-235(C). Clinical Neurosurgery. Course is designed for those students with future interest in the neurological sciences. Duties include the workup and care of inpatients, workup of clinic patients, assistants in the operating room, daily rounds, and night call. Weekly conferences are held in neurosurgery, neurology, neuropathology, and neuroradiology. There are also special lectures. Every term. Weight: 8. *Wilkins, Nashold, Cook, Kramer, Oakes, and Friedman*

SUR-237(C). Investigative Neurosurgery. The student is assigned a project relating to the neurological sciences and, within reason, is provided with technical help, recording equipment, and experimental animals necessary for its completion. Each student plans and executes an individual project, with the help of the neurosurgery staff. Attendance at weekly conferences is required. Terms: Fall 1 and 2, Spring 1 and 2. Weight: 8. *Wilkins, Nashold, Kramer, and Friedman*

SUR-239(C). Clinical Otolaryngology. This course will provide the student with a comprehensive survey of clinical otolaryngology. Duties will include participation in both outpatient clinic activities and inpatient care in addition to assisting in the operating room. The student will participate in ward rounds and in the various conferences held by the division. Every term. Weight: 4 or 8. *Hudson, Kenan, Cole, Farmer, and Fisher*

SUR-240(C). Otolaryngologic Seminar. This conference and demonstration course will provide an introduction to a variety of clinical problems in otolaryngology. Lectures will be supplemented with case presentations illustrating problems encountered in this field. Every term. Weight: 1. *Hudson*

SUR-242(C). Psychophysiology of Hearing. An examination of the relation of anatomy and physiology of the central auditory system to auditory discriminations. Original papers on neuroanatomy, electrophysiology, and psychophysics of hearing will be read and discussed. Also listed as Psychology 286 in *Graduate School Bulletin*. Terms: Spring 1 and 2. Weight: 3. *Casseday*

SUR-245(C). Reconstructive Plastic Surgery. A study of broad principles of trauma, wound, healing, and varied reparative processes. Every term. Weight: 8. *N. Georgiade, Serafin, Riefkohl, Barwick, and G. Georgiade*

SUR-255(C). Seminar in Medical Speech/Language Pathology and Audiology. Overview of normal speech, hearing and language systems, and consideration of principles of evaluation and rehabilitation of communication disorders including hearing impairments, childhood language disorders, stuttering, aphasia, voice disorders, laryngectomy, and craniofacial anomalies. Every term. Weight: 1. *Kunze and Weber*

SUR-259(C). General Principles of Orthopaedics. A full-time or part-time experience on the orthopaedic service with duties and responsibilities similar to a junior intern. Inpatient care, outpatient examination, and operating room experiences are included. Individual or group discussions each day with attending staff. The purpose of the course is to present broad concepts of orthopaedics to students planning general practice, pediatrics, allied surgical specialties, or orthopaedics. Every term. Weight: 4 or 8. *J. Goldner, Clippinger, McCollum, Bassett, Urbaniak, Harrelson, Hardaker, Nunley, R. Goldner, Garrett, and staff*

SUR-261(C). Office and Ambulatory Orthopaedics. A full or part-time experience on the orthopaedic service with duties and responsibilities similar to a junior intern. Inpatient care, outpatient examination, and operating room experiences are included. Individual or group discussions each day with attending staff.

The purpose of the course is to offer clinical experience to students who have completed Surgery 259(C). Rotations will be similar to those of Surgery 259(C). Terms: Fall 2 or Spring 2. Weight: 8. *Bassett, Clippinger, J. Goldner, McCollum, Urbaniak, Bugg, Coonrad, Lincoln, Glasson, Lang, Frank, Harrelson, Hardaker, R. Goldner, Garrett, and Nunley*

SUR-267(C). Clinical Conference in Cerebral Palsy and Children's Orthopaedics. Conference is arranged for those interested in neurological disease, pediatric orthopaedic problems, and related fields. These conferences demonstrate both the individual and group approach to the patient with complex neurologic conditions as it effects both growth and development. Outpatients and inpatients are utilized for subject material. Staff personnel readily available for individual seminars. Terms: Fall 1 and 2, Spring 1 and 2. Weight: 2 or 4. *Coonrad, Goldner, and cerebral palsy staff*

SUR-276(C). Advanced Clerkship in Pediatric Surgery. This course is designed to familiarize the student with the whole range of surgical problems in children but with emphasis on the pathophysiology of surgical and related problems in the newborn infant and the total care of the child with a malignancy. The student is encouraged to participate fully in the patient care aspects of the service, and is considered an integral part of the patient care team. Although the course may be taken for the full eight weeks, it is felt that a four-week experience is probably optimal for most students. It may be combined with other advanced surgical clerkships, such as Surgery 299(C); or with four weeks of neonatology, Pediatrics 225(C); or other courses depending on the interests of the student. Every term. Weight: 4 or 8. *Filston*

SUR-277(C). Orthopaedic Research. Individual projects are assigned for completion during a limited period of time. A student works with an investigator in the orthopaedic laboratory either at Duke Medical Center or the Durham V.A. Hospital. Clinical investigative studies are also available at both institutions. Every term. Weight: 8. *Goldner, Urbaniak, Harrelson, R. Goldner, Garrett, orthopaedic senior staff, and house staff*

SUR-281(C). Introduction to Fractures and Musculoskeletal Trauma. Students will participate in the emergency management of patients through the Duke Emergency Room primarily, but also through Durham County General and the Durham V.A. Hospitals. Principles of fractures in trauma will be given throughout the week at specified times and attendance at fracture conference will be required. Participation in orthopaedic clinic (seeing patients) one day per week will be required. Every term. Weight: 3. *Entire senior staff at Duke and Durham County General, supervision by Dr. Goldner at Duke, Dr. Harrelson at V.A., and Dr. Lang at Durham County General*

SUR-282(C). Advanced Surgery—Emphasis Cancer. Advanced concepts in surgery will be presented in seminars, and in ward, clinic, and operating room experiences. Fifty to 75 percent of the time will be devoted to clinical cancer and related basic topics, and the remainder to surgery generally. Terms: Fall 1 and 2, Spring 1 and 2. Weight: 8. *Shingleton, Seigler, Grant, and Leight*

SUR-283(C). Advanced Surgery—Emphasis Cardiovascular-Thoracic. Advanced concepts in surgery will be presented in seminars and in ward, clinic, and operating room experiences. Fifty to 75 percent of the time will be devoted to cardiovascular-thoracic surgery and related basic topics, and the remainder to surgery generally. Term: Fall 2. Weight: 8. *Sabiston, Oldham, Sealy, Wolfe, Young, Wechsler, R. Jones, Fuchs, Cox, Lowe, and Rankin*

SUR-284(C). Advanced Surgery—Emphasis Transplantation. Advanced concepts in surgery will be presented in seminars, and in ward, clinics, and

operating room experience. Fifty to 75 percent of the time will be devoted to clinical transplantation and related basic topics, and the remainder to surgery generally. Term: Spring 1. Weight: 8. *Stickel, Seigler, Amos, Bollinger, and Weinerth*

SUR-299(C). Advanced Surgical Clerkship. This course is structured to provide the student with a comprehensive approach to surgical disorders. Each student will choose to work in the clinics, or on the wards, in the operating rooms and in the laboratory with one senior surgeon. Advanced concepts in surgery will be taught and problem-solving techniques will be demonstrated. Every term. Weight: 4-8. *Sabiston, S. Jones, Oldham, Peete, Postlethwait, Sealy, Seigler, Shingleton, Stickel, Young, Wolfe, R. Jones, Fuchs, Cox, Grant, Leight, Akwari, Bollinger, Lowe, and Rankin*

SUR-301(C). Emergency Department Surgical Care. Students desiring additional experience working with care of emergency surgical patients will be assigned to the emergency department one night per week for each credit desired. They will participate in the diagnosis and care of acute and traumatic surgical emergencies. Every term. Weight: 1-3. *Moylan and G. Georgiade*

SUR-303(C). Trauma Service. This course is designed to provide students interested in trauma care with further experience both in the Emergency Department and on the inpatient Trauma Service. The course will emphasize both triage and resuscitation for major and minor emergency problems in the Emergency Department and also preoperative and postoperative care on the inpatient Trauma Service. The student will have a full-time experience by assuming duties and responsibilities similar to a junior intern. Emphasis will be placed on developing skills in the care of patients with multisystem injuries in the Emergency Department, Inpatient Service, and Operating Room. Students will work in conjunction with the attending staff and the residents on the trauma service. Every term. Weight: 8. *Moylan and G. Georgiade*

SUR-304(C). Nutrition in the Hospitalized Patient. This course is designed to acquaint students with the techniques of nutritional assessment including somatic protein, visceral protein mass, body fat mass, immune competence, and metabolic balance studies. Students will learn to determine basal energy expenditure and nitrogen requirements. The metabolic effects of acute and chronic starvation as well as stress and infection and the role played by these events in the hospital course of patients will be studied. Emphasis will be placed on techniques of nutritional support including routine and specialized hospital diets, routine and modular tube feeding diets, peripheral intravenous protein sparing, and total parenteral nutrition. At the completion of the course, students will have a thorough grasp of clinical nutrition and be able to apply specialized oral diets, tube feeding diets, and intravenous nutrition. Terms: Spring 1 and 2. Weight: 2. *Grant*

Special Interdisciplinary Training Programs

BSP-301(B). Biobehavioral Study Program. The focus of the program will be to obtain an understanding of basic processes underlying normal and pathological human behavior. The year-long or two-term experience is designed to familiarize the medical student with significant developments in the behavioral sciences, investigative methodology used to examine human behavior, and the application of findings to medicine. Each student will be given the opportunity to focus on some determinant of human behavior which may include biological, psychological, developmental, or social factors. The major portion of the student's time will be spent in closely supervised library or laboratory research in an area of the student's interest, resulting in the preparation of a report of the work. To augment the specific interest of the student, either through seminars or guided readings,

familiarity with current issues in the biobehavioral sciences will be emphasized. Students enrolled in this program may take courses given in the medical and graduate schools, and it is expected that they will integrate and balance their work with some courses of general medical importance. The faculty for the Biobehavioral Study Program is a multidisciplinary group representing several departments of the Medical School and the University and is involved in a broad range of interests in individual and group behavior. Students are encouraged to contact faculty members prior to enrollment in this study program to investigate areas of mutual interest that will form the basis for the supervised research experience.

The following outline describes material from which topics may be chosen for individual research or for discussion in the seminar or guided reading portion of the course. Additional areas, not listed, may be considered.

1. *Orientation to Research in the Biobehavioral Sciences.* Assumptions; measurements; history and philosophy of science; application of computer technology in biobehavioral research.
2. *Psychological, Biochemical, Endocrinological, and Psychopharmacological Correlates of Behavior.* Methods and techniques; role of autonomic arousal as relating to psychophysiological experiments; interrelations of CNS and ANS functioning; neurochemical and pharmacological factors affecting normal and abnormal feeling states, states of awareness, cognition, memory, and psychomotor manifestations; effect of CNS catecholamines, hormones, and behavior; correlations between serum levels of psychotropic drugs and their metabolites and behavior response to drugs; platelet MAO, acetylation capacity, total body clearance of antidepressive agents; behavioral untoward effects of psychotropic drugs and their relationships to personality, serum levels of these drugs, and biochemical effects.
3. *Personality and Individual Differences.* Personality theories, psychopathology.
4. *Cognitive Processes.* Intelligence, perception, cognition, ability, learning and development.
5. *Groups and Social Processes.* Social pattern and communication; social deviance; psychological studies of minority groups, sociology of life cycle changes; group psychotherapy. Every term. Weight: 9 units per term. *Program Director: Clifford*

CVS-301(B). Cardiovascular-Respiratory Sciences Study Program. The Study Program in Cardiovascular-Respiratory Sciences (CVS) is designed to offer third-year students instruction for one academic year in basic sciences as applied to the understanding of the cardiovascular and respiratory systems in health and disease. The program is interdepartmental in nature and will constitute a full credit load for those students who participate. It is comprised of three parts that run concurrently.

1. *Individual Tutorial.* The student will identify a senior member of the medical school faculty who is participating in the program and whose field of work is in the cardiovascular or respiratory area. The major part of the educational program for the student will be in the form of individual tutorials with this member of the staff. This tutorial may range from full-time independent research to an intensive study experience for the student. The student and the tutor will develop a plan and the student will review it with the director of the program.
2. *Group Seminar.* A seminar series will be developed according to the needs and desires of the students, the purpose of which is to read and discuss selected papers and/or discuss problems and topics which arise in the course of the lectures or are complementary to them. Students will be active participants in the seminar, and through this mechanism it is hoped to integrate knowledge of cellular physiology into an understanding of organ system function and control.

3. *Lecture Courses.* The following courses are required: PHS-221, The Heart and Peripheral Circulation in Health and Disease, and PHS-222, The Respiratory System in Health and Respiratory Disease. These courses will present selected topics in cardiovascular and respiratory physiology including analysis and evaluation of experimental and clinical studies relating to selected diseases of circulation, cardiac electrophysiology and arrhythmias, ventricular-atrial function, disordered mechanical function and coronary blood flow, pulmonary mechanics, central and peripheral regulation of ventilation, pulmonary circulation and respiratory responses to exercise, altitude, and hyperbaric environments.

The above plan provides a structured and recommended curriculum design. Within this framework multiple pathways are available because of the concentration of effort in the tutorial experience. Tutorials can be arranged within any of the basic science departments or with individuals in clinical departments whose orientation or research is consistent with the goals of the program. Once a tutor is identified, added flexibility is gained by having the option to elect courses in addition to the required course in physiology and pharmacology or to elect seminars in addition to the group seminar. Terms: Fall 1 and 2, Spring 1 and 2. Weight: 9 units per term. *Program Director: P. Anderson*

EDR-301(B). Endocrinology and Reproductive Biology Study Program.

This interdepartmental program is designed to provide third year medical students with an opportunity for indepth study of cellular endocrinology, neuroendocrinology, and reproductive biology as these relate to the function of the endocrine and reproductive systems in health and disease. In this program, major emphasis is placed on development of a plan of independent study for each student which is based on a tutorial or preceptor association with an individual



member of the program faculty. In addition, all members of the program, including faculty, meet regularly for seminars, discussions, and guest lectures on selected topics of interest to the entire group. ANA/PHS 417, PHR-335, and ANA/PHS 418/424 are an integral part of the program. A student normally spends four terms in the program and receives full credit for the medical school advanced basic science requirement. Although the program traditionally begins in September, its structure is potentially flexible enough to accommodate those who wish to begin in any term, including the summer terms. It should be emphasized that while the primary aim of the program is to provide an intensive experience in endocrinology and reproductive biology, opportunity is provided within the program format for students to broaden their basic science background by taking courses which may be unrelated to the subject matter of the study program.

For all students, the program consists of the following components:

1. *An Individual Tutorial.* This is carried out in association with one or more senior faculty members selected by the student and generally involves laboratory research in a particular area of endocrinology or reproductive biology. Before entering the program, students are asked to complete their tutorial arrangements. In order to facilitate this process, the Program Director will, on request, direct students to appropriate members of the program faculty or other members of the Medical School faculty whose specialty and research interests would permit them to participate in the program.
2. *Lecture Courses.* Specific course offerings in this program are: PHR-335, Molecular Pharmacology; ANA/PHS 417, Cellular Endocrinology; ANA/PHS 418, Reproductive Biology; ANA/PHS 424, Seminar in Reproductive Biology. In order to provide additional breadth of preclinical experience related to immediate or long-term interests, students are encouraged to take up to four units of course work per term. As noted above, individual course selections are not limited to those related to endocrinology or reproductive biology, although consultation with the preceptor is recommended before making final selections. Terms: Fall 1 and 2, Spring 1 and 2. Weight: 18 units per semester. *Program Director: Schomberg*

EPI-301(B). Epidemiology Study Program. Epidemiology is the study of the distribution and determinants of disease occurrence in human populations. This study program will provide a basic grounding in epidemiologic principles and methods. Seminars, lectures, and research projects are combined to provide a comprehensive experience in quantitative approaches to the study of health and disease in populations.

Epidemiology is a science of growing importance. Its most important role today is the initial identification of causal associations and the formulation of new etiologic hypotheses. Increasingly, epidemiologists are being recognized as specialists in research design and data analysis for studies involving human subjects. The epidemiologic approach particularly lends itself to interdisciplinary research, since it borrows heavily from fields such as genetics, pathology, and immunology. Students will therefore be encouraged to take one or more related basic science courses outside of the study program.

The program will have a core of required courses and seminars supplemented by elective tutorials in areas of special interest. The required courses focus on epidemiologic and biostatistical research methods. Tutorials will take the form either of participation in ongoing research projects or of individual supervised studies. Such study topics will be carefully selected so that they may be completed in a reasonable period of time and lead to publication of results.

Program Core (Required Courses)

1. *Epidemiologic Principles and Methods*. Instructors: Grufferman, DeLong, Delzell, and Kimm. Topics covered in this course include the study of the distribution of disease in populations, issues in study design, data collection, and methods of analysis. Modules on the subjects of case-control, cohort and cross-sectional studies, clinical trials and intervention studies are presented. Methods are also introduced for assessing and dealing with bias, misclassification, and confounding. Primary reference papers serve as the main text for the course to enable students to gain facility in the critical review of medical literature. Lectures will be supplemented by outside readings, seminars, and student presentations. (Same as CFM-240(B).)
2. *Biostatistics in the Medical Sciences*. Instructor: DeLong. A practical approach to statistical methods and their use in medicine and the related health sciences. Particular emphasis will be placed on issues in the design, conduct, and interpretation of clinical and epidemiologic studies. Topics covered will include data collection and management, as well as tests of statistical significance for rates and ratios as measures of disease risk, survival analysis, variable selection techniques, and multivariate models for disease risk. Examples from real data and the medical literature will be used extensively. Also listed as CFM-215(B).
3. *Topics in Epidemiologic Research (Seminar)*. Instructors: Grufferman, DeLong, Delzell, and Kimm. The seminars focus on problems in the design and conduct of epidemiologic studies and analysis of data. Discussion is based on faculty and student research projects and supplemented by selected readings. Visiting scientists will be invited to present their work at the seminars. Emphasis will be placed on critical analyses of epidemiologic studies. The range of topics will expose the student to all major aspects of epidemiology (e.g., areas of communicable disease, mental illness and chronic disease epidemiology). Open only to program participants.
4. *Research Projects in Epidemiology*. Instructors: Grufferman, DeLong, Delzell, and Kimm. Students are required to participate in ongoing research projects or to conduct supervised studies of their own. A wide range of research topics is available to the student with emphasis on projects which can be completed in a reasonable period of time and lead to publication. Each student will work closely with an appointed preceptor.

Program Core (Optional Course)

5. *Nutrition Epidemiology*. Instructor: Kimm. Nutrition epidemiology may be defined as the study of the role of the nutrition factor in the *casual web* of illness patterns in human populations. This course offers a systematic review of population approaches to the study of nutrition. Currently, most nutrition courses are primarily concerned with studies using *in vitro* laboratory techniques, animal models, or individual human subjects, with minimal emphasis on human population groups in their natural environments. In the course, emphasis will be placed on methods available for chronic disease epidemiologic research since most nutritional disorders in man are basically chronic. Particular attention will be directed to principles of research design and critical analyses of selected studies. It is hoped that at the completion of the course, the student will be prepared to design and conduct population-based studies on human nutrition. (Same as CFM-242(B).)

All courses with the exception of Topics of Epidemiology Research Seminar are open to students outside of the program. Terms: Fall 1 and 2, Spring 1 and 2. Weight: 9 units per term. *Program Director: Dr. Seymour Grufferman*

ISP-301(B). Immunology Study Program. Objectives: this study program is designed for students whose career goals lie in one of the many clinical specialties which interface broadly with immunology: allergy-immunology, infectious dis-

eases, rheumatology, hematology, transplantation, and oncology. A general fund of information is provided in the core course, Medical Immunology (MIC-330B), which emphasizes the role of immunologic mechanisms in various human disease states. Each student chooses a faculty preceptor, with whom an original research project is worked. It is encouraged that the student not be injected into the continuum of the preceptor's research interests but, rather, that an individual project is developed which can be completed during the study program. This laboratory effort may continue for two to four terms. The primary goals of the program are to encourage and develop the student's own creativity, to expose the student to the research interests and philosophies of the entire division and to help the student gain a useful personal perspective on current immunologic thought with an emphasis on clinical relevance.

The student's efforts and time are divided as follows:

1. *Preceptorship*. The major emphasis of the program, during which the student functions much as a graduate student in the division. 30 hours or more per week.
2. *Basic Immunology (MIC-2918)*. An in-depth course in the basic concepts of immunology. Analysis of antigens and antibodies is followed by an emphasis of the cellular aspects and organization of the immune system, its regulation, and effector mechanisms. While primarily a graduate course, MIC-291(B) is strongly recommended for those students intending to pursue a career in immunologically related fields. 4 hours per week. Terms: Fall 1 and 2.
3. *Medical Immunology (MIC-330B)*. The basic concepts of immunochemistry and immunobiology are reviewed in the first two weeks, and the remainder of the course describes the role of these concepts in the pathogenesis and treatment of several human disease states. Emphasis is given to tumor immunology, immuno-hematology, immunologic deficiency diseases, neuroimmunology, transplantation, autoimmunity, inflammation, and allergy. Patient presentations when applicable. Because the course meets daily, more than superficial coverage of the topics can be achieved. 5 hours per week. Terms: Spring 1 and 2.
4. *Seminars for Research Progress*. Throughout the year each faculty member, fellow, and student in the division presents a brief informal seminar on on-going research. The discussion that follows is of great help to the presenter and allows the student to observe and participate in critical analysis of research before it is at the polished publication or formal seminar stage. 1 hour per week.
5. *Immunology Division Seminar*. A series of formal seminars by division faculty and visiting scientists. 1-2 hours per week.
6. *Additional Course Work*. The student may elect to take any of several courses in immunology and related fields, but is generally discouraged from excessively diluting the laboratory experience. Terms: Spring 1 and 2. Weight: 9 units per term. *Program Director: Dr. Scott*

MCD-301(B). Molecular and Cellular Basis of Differentiation Study Program. Objectives: recent advances in molecular and cell biology provide new concepts in the area of developmental biology. This program is designed to give the medical student an appreciation of the phenomena of development as well as advanced training in a variety of biomedical disciplines. In order to provide a comprehensive coverage for many areas the program has been organized on a multidisciplinary level.

Particular emphasis is placed on the biochemistry of the cell surface as a basis of cell recognition, control of the cell cycle, and overall tissue organization. An analysis of protein nucleic acid interactions in chromosome structure and function are considered in the light of newer concepts of transcriptional and translational

control. Studies also include nuclear cytoplasmic interactions as well as hormone induction of differentiation and development. The rapidly expanding body of knowledge gained from these approaches will be examined by the medical student through seminars. The program provides an opportunity for the medical student to obtain an introduction to advanced training or research in a field of study of interest, including hematology, endocrinology, pediatrics, and immunology.

The program can be selected by the student for one or two semesters. First Semester: the first semester will consist of (1) a series of lectures given three times a week to cover basic principles, and (2) a series of seminars conducted by the students under the guidance of the faculty. The student will learn through direct observation, participation, and discussion with the staff.

The students will meet Monday, Wednesday, and Friday at 11:20-12:10 to attend the introductory course in development and differentiation. This course covers basic principles and is taught by the entire faculty for the purpose of establishing a firm foundation for the more advanced studies to be given in the second semester. The students will also prepare and attend seminars in differentiation and development. These seminars will be conducted by the students under the guidance of the faculty.

Upon entrance into the program the student will be interviewed by the faculty to suggest a program that will complement a future medical career. Students may also elect to spend part of their time in a library project under close faculty supervision, to be presented in an indepth seminar. As a general rule, mornings are reserved for course work and the afternoons for library tutorials.

Second Semester: the students in the second semester will attend an advanced course in development (#224) as well as other appropriate courses comprising the study program. It should be emphasized that the student is provided considerable flexibility in this program since there is no penalty for taking eighteen hours of course work for the first semester only. Terms: Fall 1 and 2, Spring 1 and 2. Weight: 18 per semester. *Cochairmen: McCarty and Counce*

NSS-301(B). Neurosciences Study Program. The neurosciences study program offers a comprehensive, integrated experience in the basic sciences focused on the nervous system. Fundamental principles of physiology, biochemistry, pharmacology, immunology, and anatomy are taught through an understanding of organizational and cellular neuroscience. The program lasts thirty-two weeks and includes optional lectures, a basic research experience under the guidance of a preceptor, and a monthly seminar. By emphasizing neuroscience, this program will be of use to students planning careers in several subspecialties of internal medicine (neurology, endocrinology, cardiology, infectious disease, genetic and metabolic disease), psychiatry, ophthalmology, pediatrics, or surgery. Weight: 9 per term.

1. *Lectures:* Trainees are encouraged to take PHS 270 and 272 (neurobiology) during the year. They also may attend the basic neuroscience program for neurology residents and the neurology division study group during the year.
2. *Research Experience:* An important component of the neurosciences study program is the opportunity for investigation in a basic science laboratory. The trainee will select a preceptor and work in the preceptor's laboratory. The objective of the laboratory experience is to familiarize the student with experimental design, analytical techniques, and interpretation of data. Although the student will work on an individual project, he or she will acquire considerable general knowledge from pursuing a laboratory problem in depth.
3. *Seminar:* Throughout the year, faculty members and students meet monthly to present informally ongoing research. This seminar allows the student to participate in open, critical discussion of laboratory investigations as well

as to develop skills in presenting scientific information clearly and concisely.

4. *Participating Faculty:*

Dr. James Davis, (medicine and pharmacology). Neuronal plasticity and neurobiology of catecholamine neurons; the neurobiological basis of recovery of function after stroke.

Dr. Frans Jöbsis, (physiology). Cerebral oxidative metabolism, *in vivo* monitoring of brain cellular metabolism in animals and humans.

Dr. James McNamara, (medicine). Biochemical basis of epilepsy; studies of brain neurotransmitter receptors in animal models of seizures.

Dr. J. Victor Nadler, (pharmacology). Neuropharmacology of the hippocampus; neuronal plasticity and recovery of function after lesions.

Dr. Allen Roses, (medicine and biochemistry). Membrane abnormalities in the muscular dystrophies; studies of membranes in genetic diseases and aging.

Dr. Saul Schanberg, (pharmacology and medicine). Animal model of the maternal deprivation syndrome; regulation of hormone responses by the brain; neuropharmacology of amphetamines.

Dr. Cliff Schold, (medicine). Tissue culture studies of human brain tumors; biochemical and immunological identification of specific markers for nervous system malignancies.

Dr. George Somjen, (physiology). Electrophysiology studies of epilepsy, visual function, and the basal ganglia.

Dr. Ara Tourian, (medicine). Tissue culture studies of genetic diseases; membrane abnormalities in Huntington's Chorea.

Dr. F. Stephen Vogel, (pathology). Cellular biology of brain tumors, neurochemistry of melanin production; neurobiology of dementia.

Dr. Wilkie A. Wilson, (medicine and pharmacology). Cellular neurobiology; mechanisms of actions of convulsants and anticonvulsants; use of electrophysiology and biophysics to analyze neuronal activity.

5. *Codirectors:* Dr. Allen Roses and Dr. James Davis

VSP-301(B). Virology Study Program. Objective: to indicate the relevance of investigative virology to problems of clinical medicine and to provide an introduction to recent advances in virus research. The student's efforts and time are divided as follows:

1. Lectures and Seminars: Students will take MIC-301(B), Principles of Infectious Diseases. (6 hours per week.)

This is a lecture and seminar course designed to familiarize students with the basic biologic concepts, the pathogenesis and the clinical manifestations of infectious diseases caused by bacteria viruses, fungi, rickettsia, and selected parasites. The host defenses to infectious agents including the acute inflammatory response and humoral and cellular immunity, and current future trends in the development of vaccines and antimicrobial and antiviral agents will also be discussed.

2. Other Courses. Students in the program will have an option to take one additional relevant lecture course, approved by the course directors.

3. Individual Tutorial. During the remainder of the time each student will be supervised by a faculty member participating in the program in a study project. It is believed that it would be most beneficial for a student to carry out a laboratory research project. Lectures and seminars have been planned so that students can spend at least five to six hours each day in the laboratory. In the case that the program directors would approve of a project of a different nature, the student again would be supervised by one of the participating faculty members. In a study project of this kind, a student might be expected to take more than one additional relevant

course. Terms: Fall 1 and 2. Weight: 9 units per term. *Program Directors: Keene and Wilfert*

IND-300(B) or (C). Interdisciplinary Seminar in Medical-Legal-Ethical Issues. The seminar will be composed of students in approximately equal number from the Medical, Divinity, and Law Schools, and will explore important medical, legal, and ethical features of current issues (e.g., transplantation, euthanasia, abortion). Faculty and resource persons from all three schools will participate in the seminar. Up to four introductory sessions in the fall semester for all participating students and faculty will be concluded with arrangement of interdisciplinary terms and selected topics. Student teams will meet during the winter and consult at intervals with faculty. All seminar participants will reassemble for a series of weekly meetings, ending in mid-March, to present and discuss the topics researched. Any topics, properly focused, may be considered. Terms: Fall 2 and Spring 1. Weight: 2. *Gianturco (Medical), Shimm (Law), Smith (Divinity), and other faculty members from all three schools*

School of Nursing



The Nursing Programs*

Bachelor of Science in Nursing. The School of Nursing offers a four-year course of study leading to the degree of Bachelor of Science in Nursing. Thirty-two courses including small-group learning experiences and thirteen upper division required courses in nursing are necessary to complete the program.

The first two years of the curriculum consist of required courses and elective courses in liberal arts, basic sciences, or nursing. The third and fourth years consist of the required courses in the nursing major, with provision for electives in the arts, sciences, or nursing. Opportunities are provided for students to undertake independent studies in nursing or other areas of interest.

Early in the junior year, students participate in clinical nursing practice where they acquire knowledge, skills, and attitudes appropriate for professional nursing. Provision for elective courses in most semesters enables the student to pursue a secondary or complementary field of interest, including the opportunity to acquire a second major. Option to pursue electives in nursing provides the opportunity for each student to begin in an area of concentration in clinical nursing.

Graduates are eligible to apply for examination for licensure as registered nurses in any state. Additional information may be obtained by writing for the *Bulletin of Duke University: Undergraduate Instruction*.

Master of Science in Nursing. The Master of Science in Nursing program prepares nurses to assume major leadership roles in the improvement of methods of delivery and the quality of health care of selected target populations in a chosen setting or settings. The practice sites of students can encompass all stages and phases of health and illness as experienced by people as individuals, and as members of families, groups, complex organizations, and communities.

The faculty believes that graduate education best takes place in an environment which fosters a combination of wisdom and imagination and promotes curiosity and freedom to innovate, rather than one which is limited to the acquisition of knowledge and skills which are required for practice in the present.

The graduate of the program, regardless of the chosen area of clinical interest, will be expected to: (1) demonstrate expertise in a defined area of advanced clinical

* At the time of printing, the programs, courses, and credits of the School of Nursing are undergoing significant change. In 1983-84 and thereafter, they will either not be available or not available exactly as described in this bulletin. For information, inquire at the Office of the Registrar.



nursing practice, (2) conduct inquiry into the nature of health and the practice of nursing, (3) demonstrate expertise in the management of health care, (4) employ strategic approaches to changing social systems for the improvement of health care, and (5) operationalize the values, goals, and behaviors appropriate to a community of scholars and unique to the discipline of nursing.

The curricular plan emphasizes flexibility within a basic structure to best afford the realization of students' varying professional goals. Students concentrating on selected areas of nursing practice design the clinical component of the core courses in a manner suited to the achievement of their specified goals, but they also participate in seminars with student peers.

The program is three semesters in length for a full-time student in advanced clinical practice and can be completed within one calendar year. Four semesters are required for nursing service administration. Part-time study is available with program completion expected in three years. Clinical facilities and learning resources in the Medical Center and surrounding community are varied and easily accessible.

Curriculum Plan. Advanced clinical practice: First semester: Research and Theory Development in Nursing I (4 units); A Systems Perspective for Nursing, Practice I (5 units); two electives (6 units). Second semester: Research and Theory Development in Nursing II (4 units); A Systems Perspective for Nursing Practice II (5 units); one-two electives and/or thesis (6 units). Third semester: clinical practicum (10 units); elective or thesis (3 units). Nursing Service Administration: Core courses as listed above plus health administration courses and an elective taken over four semesters.

Electives may be nursing or non-nursing courses. A thesis option may be pursued in lieu of 6 units of electives.

Students completing the program will be awarded a Master of Science in Nursing degree and will be prepared to function as clinical specialists or nursing service administrators. For those seeking positions in teaching, an additional semester of courses is available.

Admission Requirements. (1) Bachelor's degree with an upper division major in nursing from a National League for Nursing accredited program; (2) an undergraduate scholastic average of B or better; (3) satisfactory performance on the Graduate Record Examination Aptitude Test; (4) an introductory course in descriptive and inferential statistics; (5) registration as a professional nurse in North Carolina; (6) interview.

Dates for Application. An application with all supporting documents must be submitted by 1 August for fall semester admission; 15 November for spring semester admission; 15 March for summer session admission. (Spring and summer part-time study only.)

Tuition and Financial Aid. Tuition is \$220 per unit. A number of federal and merit traineeships are available to qualified students for full-time study.

Appendix

ROSTER OF HOUSE STAFF BY DEPARTMENTS

Anesthesiology

Chief Resident: Eileen Steinberger, M.D. (Michigan, 1979).

Senior Residents: Paolo Flezzani, M.D. (Univ. of Bologna, Italy, 1977); William Greeley, M.D. (Texas at Houston, 1976); Betty Johnson, M.D. (West Virginia, 1974); David Klein, M.D. (Maryland, 1980); Michael Lasecki, M.D. (Michigan State 1978); Carl Nielsen, M.D. (Univ. of Copenhagen, Denmark, 1979); Vinit Patil, M.D. (Wisconsin, 1980); Elizabeth Schreiner, M.D. (Duke, 1980).

Senior Assistant Residents: Ralph P. Baker, M.D., (Duke, 1980); Richard Moon, M.D. (McGill, 1973); James F. O'Neill, M.D. (Duke, 1980).

Junior Residents: John Benet, M.D. (South Florida, 1981); Sheryl Dickman, M.D. (Med. Coll. of South Carolina, 1981); Lorraine F. B. Feiner, M.D. (Duke, 1981); Robert F. Goad, M.D. (Creighton, 1973); Gary Latson, M.D. (Texas A&M, 1981); Kimberly Shaftner, M.D. (Ohio State, 1981); Richard L. Wolman, M.D. (Mount Sinai, CUNY, 1979).

Junior Assistant Residents: Lloyd J. Faul, M.D. (Virginia, 1982); Anthony J. Fister, M.D. (Northeastern Ohio, 1982); Russell F. Hill, M.D. (Emory, 1982); Roy D. Russell, M.D. (New York Med. Coll; 1977); Gijsbertus van Staveren, M.D. (Univ. of Leiden, Holland, 1982).

Family Medicine

Chief Residents: James E. Carroll, M.D. (New York Upstate Med. Center, 1980); R. Scott Eden, M.D. (Duke, 1980); Marla J. Tobin, M.D. (Missouri, 1980).

Residents: Marcia A. Angle, M.D. (Duke, 1981); Dexter L. Bacote, M.D. (Brown, 1982); Walter E. Broadhead, M.D. (Duke, 1982); Richard P. Brunswick, M.D. (New York at Buffalo, 1981); Andrew T. Chernack, M.D. (Albert Einstein, 1980); Elizabeth A. Clardy, M.D. (Duke, 1982); C. Mark Costley, M.D. (Missouri, 1981); Patsy F. Daniels, M.D. (North Carolina at Chapel Hill, 1982); Paul T. Ebbert, M.D. (Utah, 1980); Mark T. Eisen, M.D. (Michigan, 1980); Richard A. Elion, M.D. (Temple, 1980); Fred M. Fox, M.D. (New Mexico, 1981); Bruce W. Goldberg, M.D. (Mount Sinai, 1982); Jane A. Higgins, M.D. (Missouri, 1982); Peter M. Johns, M.D. (East Carolina, 1981); Karin L. Kempe, M.D. (Rochester, 1981); James D. Koren, M.D. (North Carolina at Chapel Hill, 1982); Thomas E. Matheson, M.D. (Tufts, 1981); Richard S. Nelson, M.D. (Harvard, 1980); James A. Nicholson, M.D. (Pennsylvania, 1981); Jerome H. Nymberg, M.D. (Cincinnati, 1982); John C. Pettitt, M.D. (California at San Diego, 1982); Daniel E. O'Donnell, M.D. (Georgetown, 1981); Helen M. O'Donnell, M.D. (Albert Einstein, 1980); George R. Parkerson III, M.D. (Duke, 1981); Marc L. Rivo, M.D. (California at San Francisco, 1982); Janet Y. Russell, M.D. (Duke, 1980); Scott L. Smith, M.D. (Utah, 1981); Gary A. Sobelson, M.D. (Columbia, 1981); Jeffrey H. Sonis, M.D. (Pennsylvania, 1980); Frank T. Spence, Jr., M.D. (Duke, 1981); Philip E. Stover, M.D. (Eastern Virginia, 1980); Judith K. Visscher, M.D. (Washington, 1982); Lawrence R. Wu, M.D. (Duke, 1982); Marci S. Yoss, M.D. (Harvard, 1980).

Fellows: W. Perry Dickinson, M.D. (Arkansas, 1979); L. Jeannine Petry, M.D. (Ohio, 1979).

Medicine

Chief Residents: Mary L. Michels, M.D. (Ohio, 1978); J. Randall Moorman, M.D. (Mississippi, 1978).

Senior Assistant Residents: Robert D. Albertson, M.D. (Michigan, 1980); J. Michael Anchors, M.D. (Miami, 1980); Barbara J. Basuk, M.D. (Duke, 1979); David A. Bobak, M.D. (Ohio, 1980); Gregory K. Buller, M.D. (Kansas, 1980); William B. Bunn, M.D. (Duke, 1979); Thomas M. Coffman, M.D. (Ohio, 1980); C. Christine Cox, M.D. (North Carolina at Chapel Hill, 1980); Paul A. Foster, M.D. (Duke, 1980); Robert A. Harrell, M.D. (Johns Hopkins, 1980); Robert A. Havard, M.D. (California at Los Angeles, 1980); Mary E. Klotman, M.D. (Duke, 1980); Jacquelyn J. Maher, M.D. (Duke, 1979); Rex M. McCallum, M.D. (Vanderbilt, 1980); Randall R. Mercier, M.D. (Tulane, 1980); Michael N. Neuss, M.D. (Duke, 1979); Chalmers M. Nunn, M.D. (Duke, 1980); Douglas L. Packer, M.D. (Utah, 1980); Glenn Pinholster, M.D. (Georgia, 1980); Michael C. Sneller, M.D. (Kansas, 1979); Douglas J. Sprung, M.D. (Duke, 1980); E. William St. Clair, M.D. (West Virginia, 1980); Pierre L. Triozzi, M.D. (Ohio, 1980); Ronald G. Washburn, M.D. (Duke, 1979); Mark D. Weissig, M.D. (Duke, 1980); Douglas J. Willhoite, M.D. (Oklahoma, 1980).

Junior Assistant Residents: Peter M. Anderson, M.D. (Mount Sinai, 1981); John A. Bartlett, M.D. (Virginia, 1981); Scott R. Brazer, M.D. (Western Reserve, 1981); Dedra S. Buchwald, M.D. (California at San Diego, 1981); Michael S. Catapano, M.D. (Georgetown, 1979); Jeffrey I. Cohen, M.D. (Johns Hopkins, 1981); Philip J. Fracica, M.D. (Brooklyn, Downstate, 1981); Edward J. Fudman, M.D. (Duke, 1981); Glen S. Gettinger, M.D. (Emory, 1981); David M. Harlan, M.D. (Duke, 1980); Joanne M. Jordan, M.D. (Johns Hopkins, 1981); Jeffrey R. Joyner, M.D. (Illinois, 1981); Thomas A. Kelly, M.D. (New York Univ., 1981); Paul C. Kleist, M.D. (Med. Coll. of Wisconsin, 1981); Keith D. Knopes, M.D. (Stanford, 1981); Ann M. Lansing, M.D. (Duke, 1981); James T. C. Li, M.D. (Duke, 1981); James C. Lisak, M.D. (Harvard, 1981); Arthur C. Madsen, M.D. (Utah, 1981); Daryl G. Morrical, M.D. (Indiana, 1981); Pamela B. Morris, M.D. (Duke, 1981); William M. Pruett, M.D. (Johns Hopkins, 1981); Jacqueline A. Pugh, M.D. (Texas at San Antonio, 1981); William S. Putnam, M.D. (Duke, 1981); Steven J. Reiter, M.D. (Iowa, 1981); Paul V. Renda, M.D. (Mount Sinai, 1981); K. Lea Sewell, M.D. (Duke, 1980); David L. Simel, M.D. (Duke, 1980); Anthony L. Sintetos, M.D. (Georgetown, 1981); Rita M. Willett, M.D. (Washington Univ., 1981); Candyce D. Williams, M.D. (Tufts, 1981); Robert Zimmerman, M.D. (Johns Hopkins, 1981).

Interns: Christine G. Bounous, M.D. (Duke, 1982); E. Phillip Bounous, M.D. (Duke, 1980); G. Kent Chastain, M.D. (Tennessee, 1982); Paul R. Conkling, M.D. (Ohio State, 1982); Audrey P. Corson, M.D. (Colorado, 1982); Nancy L. D'Antonio, M.D. (Johns Hopkins, 1982); Jean C. Evans, M.D. (Albany, 1981); F. Roosevelt Gilliam, M.D. (Duke, 1981); Mark L. Graham, M.D. (Mayo, 1982); Randa M. Hamadeh, M.D. (American Univ. of Beirut, 1982); Stuart I. Harris, M.D. (Duke, 1982); Stevan I. Himmelstein, M.D. (Tennessee, 1982); Dennis M. Israelski, M.D. (Albert Einstein, 1981); Mark M. Kowalski, M.D. (Kansas, 1981); Kenneth D. Kronhaus, M.D. (Pennsylvania, 1982); John P. Longabaugh, M.D. (Pittsburgh, 1982); Conor F. Lundergan, M.D. (Georgetown, 1982); Michael J. Marchese, M.D. (Columbia, 1982); M. Elizabeth McCarley, M.D. (Duke, 1982); Keith R. McCrae, M.D. (Duke, 1982); Linville M. Meadows, M.D. (North Carolina at Chapel Hill, 1982); Gina L. Michael, M.D. (Duke, 1982); Gary W. Neal, M.D. (Tennessee, 1982); David A. Nichols, M.D. (Missouri, Columbia, 1982); Peggy L. Nile, M.D. (Duke, 1982); Mark A. O'Rourke, M.D. (California at Los Angeles, 1982); Alvin C. Powell, M.D. (Tufts, 1982); Susan L. Pryor, M.D. (Med. Coll. of Wisconsin, 1982); John R. Raymond, M.D. (Ohio State, 1982); Mark E. Reese, M.D. (South Alabama, 1982); Harvey Serota, M.D. (Johns Hopkins, 1982); Victor F. Tapson, M.D. (Hahnemann, 1982); Egerton K. van den Berg, M.D. (Duke, 1981); Thomas C. Wall, M.D. (Bowman Gray, 1982); Charles S. Wehbie, M.D. (Bowman Gray, 1982); Joel L. Weissfeld, M.D. (Johns Hopkins, 1981).

Fellows: Theodore R. Amgott, M.D. (Johns Hopkins, 1979); George F. Atweh, M.D. (American Univ. of Beirut, 1978); James D. Baker, M.D. (Bowman Gray, 1978); Stephen H. Bandeian, M.D. (Harvard, 1978); Gust H. Bardy, M.D. (Northwestern, 1977); Peter M. Becker, M.D. (Dartmouth, 1977); Clark T. Bishop, M.D. (Utah, 1980); David R. Bishop, M.D. (Michigan, 1978); Andrew Bragdon, M.D. (Washington Univ., 1977); B. Alton Brantley, M.D. (Duke, 1978); Robert O. Brennan, M.D. (Virginia, 1978); Archer Broughton, M.D. (Sydney Univ., 1971); Gary V. Burton, M.D. (Utah, 1978); Thomas J. Chaplinski, M.D. (Chicago, 1977); A. Alan Chu, M.D. (Duke, 1980); Cynthia Chua, M.D. (Duke, 1979); John R. Cohn, M.D. (Jefferson, 1976); Paul G. Colavita, M.D. (Bowman Gray, 1979); Darryl B. Cook, M.D. (Utah, 1979); William F. Cunningham, M.D. (Utah, 1979); Joel L. Deitz, M.D. (Tufts, 1977); James L. Deterding, M.D. (Nebraska, 1979); Richard O. Dolinar, M.D. (New York at Buffalo, 1972); Albert G. Driver, M.D. (Pennsylvania State, 1978); Madeleine Duvic, M.D. (Duke, 1976); Khaled El-Hoshi, M.D. (Cairo, 1976); Jonathan L. Elion, M.D. (Brown, 1975); John Fedor, M.D. (Duke, 1976); Jessica L. Fewkes, M.D. (California at San Francisco, 1978); Michael A. Friedberg, M.D. (San Antonio, 1981); Bonnie J. Goodwin, M.D. (Dartmouth, 1977); David S. Grierson, M.D. (Ohio, 1978); Karen K. Hamilton, M.D. (Stanford, 1979); Franklin Handel, M.D. (Pennsylvania, 1976); Elizabeth A. Harden, M.D. (Duke, 1977); Lindy Harrell, M.D. (Miami, 1977); Richard M. Harrell, M.D. (North Carolina at Chapel Hill, 1979); C. David Hassel, M.D. (Bowman Gray, 1979); M. Alycia Hassett, M.D. (Duke, 1978); James A. Heinsimer, M.D. (Illinois, 1977); Bruce D. Hettleman, M.D. (Harvard, 1977); Michael B. Higginbotham, M.D. (Univ. of Melbourne, 1973); James J. Hines, M.D. (Northwestern, 1978); Tomoaki Hinohara, M.D. (Keio Univ., 1975); Mark A. Hlatky, M.D. (Pennsylvania, 1976); Robert L. Huck, M.D. (Washington Univ., 1978); Robert F. Hunter, M.D. (Puerto Rico, 1978); Harry J. Iland, M.D. (Univ. of Sydney, 1976); Stephen M. Johnson, M.D. (Duke, 1978); Thomas L. Johnson, M.D. (Texas, 1977); Frederick S. Jones, M.D. (Rush, 1979); J. Wesley Jones, M.D. (Duke, 1976); Clark Kerr, M.D. (Univ. of Ottawa, 1978);

Stephen J. Klemawesch, M.D. (Alabama, 1974); Mark J. Knapp, M.D. (Wayne State, 1976); Andrew H. Laster, M.D. (Johns Hopkins, 1979); Stephen K. Lucas, M.D. (Harvard, 1977); Cheryl Mahony, M.D. (Duke, 1976); Anne C. Marchese, M.D. (Columbia, 1979); Benjamin Mark, M.D. (New Jersey, 1976); Daniel B. Mark, M.D. (Tufts, 1978); Jose C. Martin, M.D. (Miami, 1978); Janice M. Massey, M.D. (Georgetown, 1978); Joseph L. Mayus, M.D. (Illinois, 1979); Malcolm McDonald, M.D. (Royal Melbourne, 1973); S. Spence McCackren, M.D. (Duke, 1978); Andrew A. McLeod, M.D. (Univ. Coll. Hospital, 1974); Jeffrey R. Medoff, M.D. (New York Med. Ctr., 1977); Dale E. Merrell, M.D. (Pennsylvania, 1978); Cynthia M. Mulrow, M.D. (Baylor, 1978); William N. Newman, M.D. (Duke, 1977); Richard Orlowski, M.D. (Washington Univ., 1978); George Phillips, M.D. (Duke, 1978); L. Darryl Quarles, M.D. (Alabama, 1979); Martha J. Radford, M.D. (Harvard, 1978); John W. Regan, Ph.D. (Arizona, 1980); Elizabeth Riley, M.D. (Welsh National Sch. of Med., 1976); Steven F. Roark, M.D. (Duke, 1978); Wayne K. Ruth, M.D. (Duke, 1978); Norman Sadick, M.D. (Univ. of New South Wales, 1973); Wayne M. Samuelson, M.D. (Utah, 1980); Daniel Savage, Ph.D. (Pennsylvania, 1980); Donald E. Schmechel, M.D. (Harvard, 1974); Ricky M. Schneider, M.D. (Yale, 1977); Carol J. Scott, M.D. (Rush, 1979); Neal Shadoff, M.D. (Boston, 1978); Rose Shalom, M.D. (Harvard, 1978); Maryella D. Sirmon, M.D. (South Alabama, 1978); Raymond A. Smego, M.D. (New Jersey Med. School, 1978); Ian D. Smith, M.D. (Med. Univ. of South Carolina, 1978); Mark S. Smith, M.D. (Case Western Reserve, 1977); Susan P. Smith, (California, 1979); James Sosnowchik, M.D. (Ohio, 1978); Catherine Strader, Ph.D. (California Inst. of Tech., 1980); Janice Strom, M.D. (Louisville, 1978); Stephanie A. Studenski, M.D. (Kansas, 1979); Michael J. Sullivan, M.D. (Mount Sinai, 1979); Laura P. Svetkey, M.D. (Harvard, 1979); William R. Taylor, M.D. (Alabama, 1978); Stephen M. Teague, M.D. (Illinois, 1977); Marilyn J. Telen, M.D. (New York Univ., 1977); Joey Trantham, M.D. (Duke, 1976); George R. Vandembark, M.D. (Ohio State, 1978); Douglas E. Vaughan, M.D. (Southwestern 1980); Ronald G. Victor, M.D. (Tulane, 1978); Seth J. Worley, M.D. (Temple, 1978); Larry Yamaoka, Ph.D. (Oregon, 1972).

DIVISION OF DERMATOLOGY

Robert P. Albergo, M.D. (Rochester, 1978); Claude S. Burton, M.D. (Duke, 1979); Russell W. Eyre, M.D. (Utah, 1981); Lester J. Fahrner, M.D. (Illinois, 1979); Peter W. Heald, M.D. (Duke, 1978); William B. Lide, M.D. (Johns Hopkins, 1978); Elise A. Olsen, M.D. (Baylor, 1978); William S. Sawchuck, M.D. (Michigan, 1981); David N. Tashjian, M.D. (Baylor, 1980).

DIVISION OF NEUROLOGY

Robert E. Albright, M.D. (Pennsylvania State, 1979); C. Edward Coffey, M.D. (Duke, 1979); Joel Greenberg, M.D. (Miami, 1981); Daniel J. Howley, M.D. (Temple, 1979); Joseph A. Jabaily, M.D. (Case Western Reserve, 1979); Jonathan Orwitz, M.D. (Pittsburgh, 1981); Cynthia S. Payne, M.D. (Med. Coll. of Ohio, 1980); Nancy Post, M.D. (Duke, 1979); Rodney A. Radtke, M.D. (Northwestern, 1980); Cheolsu Shin, M.D. (Alabama, 1977); Donald J. Solomon, M.D. (Stanford, 1981); Ernest R. Somerville, M.D. (Univ. of Sydney, 1977).

Obstetrics and Gynecology

Chief Residents: Lawrence C. Bandy, M.D. (Duke, 1977); James F. Barter, M.D. (Virginia, 1977); Andrew Haven, M.D. (North Carolina at Chapel Hill, 1978); Charles O. Harris, M.D. (North Carolina at Chapel Hill, 1979); Ellen T. Puleo, M.D. (Duke, 1979); Kenneth F. Trofatter, M.D. (Duke, 1979); Ruthann Zern, M.D. (Duke, 1979).

Assistant Residents: Dale Bearman, M.D. (Tufts, 1981); Janice Bird, M.D. (Duke, 1980); David Chestnut, M.D. (Alabama, 1978); Neeoo Chin, M.D. (Ohio State, 1981); William C. Dodson, M.D. (Temple, 1980); Iris E. Dominy, M.D. (Albany Med. Coll., 1980); Henry Easley, M.D. (North Carolina at Chapel Hill, 1982); David Henderson, M.D. (Med. Coll. of Virginia, 1981); Claude Hughes, M.D. (Duke, 1976); Michael R. Land, M.D. (Indiana, 1980); Joyce McKenney, M.D. (Washington, 1982); Deborah Metzger, M.D. (Texas, 1982); Joanne Piscitelli, M.D. (Duke, 1980); Joel G. Puleo, M.D. (Duke, 1979); James Rice, M.D. (California, 1981); Vernon Stringer, M.D. (Duke, 1982); Chrystie Timmons, M.D. (North Carolina at Chapel Hill, 1982); Robert Van Dalen, M.D. (Duke, 1979); Roger Young, M.D. (North Carolina at Chapel Hill, 1982).

Ophthalmology

Chief Residents on rotating basis.

Residents: Howard N. Short, M.D. (St. Louis, 1978); John Bourgeois, M.D. (Virginia, 1979); Christine Nelson, M.D. (Cincinnati, 1979).

Assistant Residents: David Browning, M.D. (St. Louis, 1978); Linda Burk, M.D. (Michigan, 1980); Jonathan Christenberry, M.D. (Duke, 1980); Reginald Ishman, M.D. (Duke, 1981); Lawrence Quist, M.D. (Minnesota, 1977); Michael Rotberg, M.D. (Duke, 1979); Ann B. Sowers, M.D. (Med. Coll. of Virginia, 1979); S. Scott Stapleton, M.D. (North Carolina at Chapel Hill, 1980); Einar Stefansson, M.D. (Iceland, 1978); Walter Wright, M.D. (North Carolina at Chapel Hill, 1980).

Pathology

Residents: John L. Abernethy, M.D., Ph.D. (Duke, 1980); Renata Albrecht, M.D. (Duke, 1980); Robert Anthony, M.D., Ph.D. (Case Western Reserve, 1980); Mitchel D. Bauman, M.D. (Nebraska, 1982); Kim Boekelheide, M.D., Ph.D. (Duke, 1980); Orest Boyko, M.D., Ph.D. (Indiana, 1982, 1981); Gerald A. Campbell, M.D., Ph.D. (Texas Southwestern, 1977); James M. Crawford, M.D., Ph.D. (Duke 1982, 1981); Georgette A. Dent, M.D. (Duke, 1981); John R. Edgar, M.D. Ph.D. (Duke, 1978); Kenneth Fortier, M.D. (Dartmouth, 1976); Raymond B. Franklin, M.D., Ph.D. (Texas, 1981, 1978); James Furlong, M.D. (Michigan, 1981); Marcia Gottfried, M.D. (Northwestern, 1978); Maureane R. Hoffman, M.D., Ph.D. (Iowa, 1982); Michael Imber, M.D., Ph.D. (Duke, 1982); Kuo-Jang Kao, M.D., Ph.D. (National Taiwan Univ., 1974); Janet Kolbeck, M.D. (Emory, 1982); Peter Kolbeck, M.D. (Emory, 1982); J. Thomas Lee, M.D. (Duke, 1980); Henry Marrow, M.D. (Duke, 1978); Stephen Mullins, M.D. (Georgia, 1982); Gregg A. Olsen, M.D. (Utah, 1980) Dennis Ose, M.D., Ph.D. (Duke, 1978); Mathew Perry, M.D. (Miami, 1980); Alan Proia, M.D., Ph.D. (Cornell, 1980); Reinhardt Sahmel, M.D., Ph.D. (Duke, 1981); John Sorge, M.D. (Rochester, 1982); Charles Steenbergen, M.D., Ph.D. (Pennsylvania, 1978); Joseph A. Tucker, M.D. (Vanderbilt, 1981); Paul N. Valenstein, M.D. (Illinois, 1981); Joseph Vogel, M.D. (Duke, 1978); John Wolfe, M.D. (Michigan, 1980).

Fellows: Barbara Crain, M.D., Ph.D. (Duke 1979, 1978); Mark Shifman, M.D. (Med. Coll. of Ohio, 1978).

Pediatrics

Third Year Residents: Paul Boepple, M.D. (Vermont, 1980); Sara Chaffee, M.D. (Dartmouth, 1980); James DeMasi, M.D. (Albany, 1980); James Grant, M.D. (Duke, 1980); Earl Hampton, M.D. (Baylor, 1980); Al Hergenroeder, M.D. (Pittsburgh, 1980); Charles Hofbauer, M.D. (Wayne State, 1980); Frederick Leickly, M.D. (Western Reserve, 1980); Marc Levine, M.D. (Kentucky, 1980); Barry Marx, M.D. (Maryland, 1980); Hugh Powell, M.D. (Eastern Virginia, 1980).

Second Year Residents: Doug Hamill, M.D. (Washington, 1981); Verena Jorgensen, M.D. (Duke, 1981); Leigh Lehan, M.D. (North Carolina at Chapel Hill, 1981); Dana Matthews, M.D. (Washington, 1981); Stacy Month, M.D. (Pennsylvania, 1981); Bryan Ohning, M.D., Ph.D. (Western Reserve, 1981); Margaret Oxtoby, M.D. (Western Reserve, 1981); Luisa Portal, M.D. (Virginia, 1981); Tom Sena, M.D. (Albany, 1981); Michael Volders, M.D. (Texas at Houston, 1981); John Wagner, M.D. (Jefferson, 1981).

First Year Residents: Richard Brostoff, M.D. (Pennsylvania, 1982); Martin Bryant, M.D. (Southern California, 1982); Michael Clayton, M.D. (New Mexico, 1982); Susan Desman, M.D. (McGill, 1982); Martha Gagliano, M.D. (Duke, 1982); Craig Hurwitz, M.D. (Southwestern at Dallas, 1982); Stewart Lawrence, M.D. (Mt. Sinai, 1982); Marie Mann, M.D. (Tulane, 1982); Louise Markert, M.D., Ph.D. (Duke, 1982); Lynn McGowan, M.D. (Duke, 1981); David Smalley, M.D. (Alabama, 1982); Mary Ann Zetes, M.D. (Dartmouth, 1982).

Fellows: Marilyn Alley, M.D. (North Carolina at Chapel Hill, 1958); David Becton, M.D. (Arkansas, 1979); Timothy Bohan, M.D., Ph.D. (Miami, 1980); Teresa Brennan, M.D. (Johns Hopkins, 1978); William Cassano, M.D. (Duke, 1977); A. Jay Cohen, M.D. (Howard, 1979); Alan Cougle, M.D. (Louisiana State, 1972); Phillip DeVoe, M.D. (Indiana, 1972); Michael Freemark, M.D. (Duke, 1976); Henry Friedman, M.D. (New York Upstate, 1977); Carla Ingold, M.D. (North Carolina at Chapel Hill, 1979); Jeffory Jennings, M.D. (Tennessee, 1976); Joanne Kurtzberg, M.D. (New York Med. Coll., 1976); Ross McKinney, M.D. (Rochester, 1979); Robert Nolan, M.D. (Florida, 1979); Michael Ruff, M.D. (Texas at Galveston, 1978); Robin Shanahan, M.D. (Wisconsin, 1978); Lawrence Sindel, M.D. (Louisiana State, 1978); Deborah Squire, M.D. (Northwestern, 1978); Robert Warren, M.D., Ph.D. (Washington Univ., 1978); Alan Woolf, M.D. (Chicago, Pritzker, 1976).

Psychiatry

Chief Residents: Joseph Cools, M.D. (Michigan, 1979); Michael Kahn, M.D. (Duke, 1978); Donald Ross, M.D. (Michigan State, 1977).

Residents: Diana Antonacci, M.D. (Southern Illinois, 1982); Jack Barber, M.D. (Texas at San Antonio, 1981); Stephen Barnes, M.D. (Duke, 1980); Leigh Bishop, M.D. (Texas, 1980); Joseph Broderon, M.D. (Kentucky, 1972); Owen Buck, M.D. (Vermont, 1978); Robert Bunge, M.D. (Rockford, 1978); Susan Campbell, M.D. (South Carolina, 1978); Manjuri Chatterjee, M.D. (Univ. of Calcutta, 1974); Mary Christenbury, M.D. (South Carolina, 1980); Randall Christenson, M.D. (Creighton, 1977); Lindsay Clarkson, M.D. (Duke, 1978); Sandra Cohen, M.D. (New York, 1978); David Colvard, M.D. (Duke, 1978); Clifford Cornette, M.D. (Southwestern, 1981); Scott Cunningham, M.D. (Duke, 1981); Rodney Deaton, M.D. (Indiana, 1982); Wilhelmina DeMarchi, M.D. (Univ. of Amsterdam, 1979); Wayne Denton, M.D. (Chicago, 1982); Edward Eisenberg, M.D. (Univ. of Miami, 1982); Douglas Finestone, M.D. (Virginia, 1978); Ted George, M.D. (Bowman Gray, 1977); Mark Glenn, M.D. (North Carolina at Chapel Hill, 1978); Edward Goldenberg, M.D. (Kentucky, 1981); Romeo Gomez, M.D. (New Jersey, 1980); Candis Grace, M.D. (Duke, 1981); Bonny Gregory, M.D. (Georgia, 1977); Henry Horacek, M.D. (North Carolina at Chapel Hill, 1978); Pem Kahler, M.D. (North Carolina at Chapel Hill, 1980); Gregory Khoury, M.D. (Texas at San Antonio, 1980); Elizabeth King, M.D. (Duke, 1958); Ranga

Krishnaswamy (Krishnan), M.D. (Univ. of Madras, 1978); Michael Larson, M.D. (Manila, 1979); James Lee, M.D. (Duke, 1978); Lu Ann Leidy, M.D. (Duke, 1982); Mike Lyles, M.D. (Michigan, 1978); Richard Marciniak, M.D. (Michigan, 1981); James McCracken, M.D. (Baylor, 1980); Anne McKnight, M.D. (Duke, 1981); Keith Meador, M.D. (Louisville, 1982); Mark Miller, M.D. (New York at Stony Brook, 1981); Alan Nelson, M.D. (Loma Linda, 1979); Bruce Noll, M.D. (Temple, 1982); Mindy Oshrain, M.D. (Duke, 1982); Munira Padamsee, M.D. (Univ. of Bombay, 1974); I.S. Park, M.D. (Univ. of Seoul, 1964); Roger S. Perilstein, M.D. (Temple, 1982); Dennis Porter, M.D. (North Carolina at Chapel Hill, 1982); Eric Reiman, M.D. (Duke, 1980); Gigi Russell, M.D. (Louisville, 1980); Rene Schoenfeld, M.D. (Illinois, 1974); Lorraine Sharon, M.D. (Texas, 1979); Kim Sherrill, M.D. (Texas, 1980); Roy Stein, M.D. (Duke, 1980); Mick Storck, M.D. (Ohio, 1980); Daniel Sullivan, M.D. (Vermont, 1970); Marvin Swartz, M.D. (Tufts, 1980); David Talley, M.D. (California at San Diego, 1980); Sam Thielman, M.D. (Duke, 1980); Anne Tyson, M.D. (North Carolina at Chapel Hill, 1981); Marcia Valenstein, M.D. (Illinois, 1981); Ronald Vereen, M.D. (Duke, 1981); Joel Vogt, M.D. (Texas A & M, 1981); Michael Webb, M.D. (Texas at San Antonio, 1981); Mary Catherine Wimer, M.D. (Texas at Houston, 1982); Katherine Wu, M.D. (Duke, 1982); Antronette Yancey, M.D. (Duke, 1982).

Radiology

Residents: George Adams, M.D. (North Carolina at Chapel Hill, 1981); Arthur Castagno, M.D. (Pennsylvania, 1980); Timothy Clark, M.D. (Duke, 1981); Ella Doo, M.D. (Pennsylvania, 1978); Dale Duncan, M.D. (South Carolina, 1979); David Enterline, M.D. (North Carolina at Chapel Hill, 1982); Peter Fedyshin, M.D. (Hershey, 1976); Alan Fein, M.D. (Columbia, 1978); Evan Fram, M.D. (Duke, 1982); George Gamba, M.D. (Indiana, 1982); David Handel, M.D. (Hahnemann, 1980); Bruce Hershatter, M.D. (Tulane, 1982); Barbara Hertzberg, M.D. (Duke, 1980); Bennett Hollenberg, M.D. (Indiana, 1981); Susan James, M.D. (Duke, 1981); Marc Kaminsky, M.D. (Cornell, 1974); Gerald Lourie, M.D. (Duke, 1981); Charles Maila, M.D. (Michigan, 1979); Shaheda Maroof, M.D. (India, 1977); Leonard Mastrodomenico, M.D. (New Jersey, 1980); Shane McAlister, M.D. (Duke, 1979); Philip Moeser, M.D. (Wisconsin, 1980); Thomas Neumann, M.D. (Texas at Galveston, 1980); Mark Osborne, M.D. (Chicago, 1981); Bryan Peters, M.D. (Duke, 1981); Rita Pink, M.D. (Illinois, 1978); Charles Pope, M.D. (North Carolina at Chapel Hill, 1976); Claire Poyet, M.D. (Duke, 1981); Gordon Randall, M.D. (Tennessee, 1978); Kenneth Riley, M.D. (Duke, 1980); Scott Rosenbloom, M.D. (Hahnemann, 1980); Michael Ross, M.D. (Northwestern, 1979); Tony Smith, M.D. (East Carolina, 1981); Janet Szabo, M.D. (North Carolina at Chapel Hill, 1979); Jefferson Trupp, M.D. (Florida, 1980); Diana Voorhees, M.D. (Pennsylvania, 1981); Mary Warner, M.D. (Northwestern, 1979); Linda Wellner, M.D. (Pennsylvania, 1976); Kenneth Williams, M.D. (Duke, 1978).



Surgery

DIVISIONS OF GENERAL AND CARDIO-THORACIC SURGERY

Instructors and Teaching Scholars: Jon F. Moran, M.D. (Washington Univ., 1973); Lary A. Robinson, M.D. (Washington Univ., 1972); Peter M. Scholz, M.D. (Basel, 1970); Thomas L. Spray, M.D. (Duke, 1974).

Instructors and Chief Residents: L. George Alexander, M.D. (Duke, 1973); W. Randolph Chitwood, Jr., M.D. (Virginia, 1974); Charles E. Cox, M.D. (Utah, 1975); Richard A. Hopkins, M.D. (Duke, 1974); Richard L. McCann, M.D. (Cornell, 1974); Arthur Ross III, M.D. (Case Western Reserve, 1975).

Research Fellows: Tetsuo Asano, M.D. (Nippon Med. School, 1974); Mladjan Bozovic, M.D. (Belgrade School of Med. 1973); Ralph J. Damiano, M.D. (Duke, 1980); James M. Douglas, Jr., M.D. (Duke, 1978); Charles T. Everson, M.D. (Loyola, 1977); Thomas B. Ferguson, Jr., M.D. (St. Louis, 1979); Bruce M. Freedman, M.D. (Duke, 1982); Donald D. Glower, M.D. (John Hopkins, 1980); Richard I. Hall, M.B.B.S. (Univ. of Newcastle upon Tyne, 1976); David P. Hamm, M.D. (Louisiana State, 1980); Warren J. Kortz, M.D. (Colorado, 1979); Sashihiko Mukai, M.D. (Nippon Med. School, 1972); Jan A. Neal, M.D. (Duke, 1982); Jose Perez, M.D. (Central Univ. of Venezuela, 1968); Richard J. Peterson, M.D. (Mayo, 1979); Douglas S. Reintgen, M.D. (Duke, 1979); Stephen K. Rerych, M.D. (Columbia, 1974); Laurence J. Ross, M.D. (Case Western Reserve, 1979); James D. Sink, M.D. (Bowman Gray, 1975); Peter K. Smith, M.D. (Duke, 1977); John A. Spratt, M.D. (Washington Univ., 1980); George S. Tyson, Jr., M.D. (Duke, 1978); Walter B. Vernon, M.D. (Harvard, 1980); Robert L. R. Wesly, M.D. (Duke, 1975).

Senior Assistant Residents: Erle H. Austin, M.D. (Harvard, 1974); Richard D. Floyd, M.D. (Duke, 1978); Ronald C. Hill, M.D. (West Virginia, 1974); William L. Holman, M.D. (Cornell, 1978); J. Dirk Iglehart, M.D. (Harvard, 1975); Robert N. Jones, M.D. (Rush Med. Coll., 1976); Gary K. Lofland, M.D. (Boston, 1975); Thomas L. Novick, M.D. (Duke, 1978); Craig O. Olsen, M.D. (Utah, 1976); Robert B. Peyton, M.D. (New York, 1977); Bruce Schirmer, M.D. (Duke, 1978); Peter M. Thurlow, M.D. (Harvard, 1977); Ross M. Ungerleider, M.D. (Chicago, 1977); Peter Van Trigt, M.D. (Tulane, 1977); J. Mark Williams, M.D. (Duke, 1976).

Assistant Residents: James B. Billys, M.D. (Jefferson Med. Coll., 1981); Michael J. Bolesta, M.D. (Missouri, 1981); Stephen D. Campanella, M.D. (Jefferson Med. Coll., 1981); Clinton B. Davis II, M.D. (Duke, 1981); Michael W. Hendricks, M.D. (Florida, 1981); Leo A. Kulick, M.D. (Case Western Reserve, 1981); Susan C. Lottich, M.D. (Duke, 1981); John F. Lucas III, M.D. (Duke, 1981); Jay D. Mabrey, M.D. (Cornell University, 1981); David M. Mahvi, M.D. (Med. Univ. of South Carolina, 1981); Robert D. Mino, M.D. (Georgetown, 1981); James J. Morris, M.D. (Duke, 1981); Francis S. Rotolo, M.D. (Michigan, 1981); Kent W. Small, M.D. (Tulane, 1981).

First Year Residents: George S. Aitken, M.D. (Case Western Reserve, 1982) Bert A. Bowers, M.D. (Iowa, 1982); James C. Califf, M.D. (Duke, 1981); Thomas D. Christopher, M.D. (Duke, 1982); Ruben Kier, M.D. (Duke, 1982); Stuart J. Knechtle, M.D. (Cornell, 1982); L. Scott Levin, M.D. (Temple, 1982); Ralph A. Liebelt, M.D. (Case Western Reserve, 1982); George W. Maier, M.D. (Duke, 1982); Raymond G. Makhoul, M.D. (Chicago, 1982); James C. Martin, M.D. (Louisiana State, 1982); Lloyd B. Minor, M.D. (Brown, 1982); Charles E. Murphy, M.D. (Duke, 1982); Robert M. Peroutka, M.D. (Maryland, 1982); Julie B. Price, M.D. (Duke, 1982); Charles E. Rawlings, M.D. (Duke, 1982); Keith D. Walvoord, M.D. (Texas Southwestern, 1982); Kendall L. Wise, M.D. (Vanderbilt, 1982); William W. Woodruff III, M.D. (Duke, 1982); Mark C. Yates, M.D. (Missouri, 1982).

DIVISION OF NEUROSURGERY

Instructors and Chief Residents: Bennett Blumenkopf, M.D. (Boston, 1976); Alfred C. Higgins, M.D. (Georgetown, 1977).

Assistant Residents: Eben Alexander III, M.D. (Duke, 1980); Peter Bronec, M.D. (Duke, 1981); Robert P. Iacono, M.D. (Southern California, 1978); John D. Liddell, M.D.B.S. (Monash Univ., Australia, 1972); John J. Moosy, M.D. (Tulane, 1980); Joseph H. Piatt, Jr., M.D. (Pennsylvania, 1979); Stephen Saris, M.D. (Boston Univ., 1979); Steven J. Schiff, M.D. (Duke, 1980); Jeffrey S. Walker, M.D. (Texas at Houston, 1979); Eric D. Weber, M.D. (S.U.N.Y., 1981).

DIVISION OF ORAL SURGERY

Instructor and Chief Resident: Charles McNamara, D.M.D. (Tufts, 1979).

Assistant Residents: Thomas R. Cook, D.M.D. (Med. Coll. of Georgia, 1977); William D. Fox, D.D.S. (Tennessee, 1977); Wilbur M. Riddle, D.D.S. (Med. Coll. of Virginia, 1968).

DIVISION OF ORTHOPAEDIC SURGERY

Instructors and Chief Residents: Ned B. Armstrong, M.D. (Jefferson, 1977); Jacqueline M. Fogarty, M.D. (Albany, 1974); Robert D. Francis, M.D. (Duke, 1977); Carey W. McKain, M.D. (Duke, 1976); William O. Reed, Jr., M.D. (Missouri, 1977); Eric F. Sabety, M.D. (Columbia, 1974); W. Timothy Ward, M.D. (Pittsburgh, 1977).

Assistant Residents: Rick F. Aiden-Pospisal, M.D. (South Carolina, 1978); William C. Andrews, Jr., M.D. (Duke, 1980); David E. Attarian, M.D. (Duke, 1980); Kyle E. Black, Jr., M.D. (Bowman Gray,

1978); Samuel I. Brown, M.D. (Virginia, 1979); John A. Byrd III, M.D. (Med. Coll. of Virginia, 1978); Paul B. Chaplin, M.D. (New York Med. Coll., 1979); Todd M. Chapman, M.D. (Bowman Gray, 1979); Gregg E. Cregan, M.D. (Jefferson Med. Coll., 1978); Dennis P. Devito, M.D. (Washington Univ., 1980); Thomas A. Dimmig, M.D. (Duke, 1976); David N. Drvaric, M.D. (Emory, 1978); Keven J. Gassner, M.D. (Wisconsin, 1980); Peter W. Gilmer, M.D. (Virginia, 1980); John E. Herzenberg, M.D. (Boston Univ., 1979); David D. Kyzer, M.D. (Case Western Reserve, 1978); Neville A. Lewis, M.D. (Cincinnati, 1976); Vincent S. Mosca, M.D. (Rochester, 1979); Eric R. Oser, M.D. (Louisiana, 1979); Theodore M. Pitts, M.D. (Yale, 1977); William J. Richardson, M.D. (Eastern Virginia, 1977); Joseph F. Slade III, M.D. (Connecticut, 1979); Christopher E. Smith, M.D. (Duke, 1976); W. Howard Tiller, M.D. (Duke, 1978); Michael R. Ubino, M.D. (Rochester, 1977); Craig D. Zippe, M.D. (Rush, 1980).

DIVISION OF OTOLARYNGOLOGY

Instructors and Chief Residents: Mark R. Hanabury, M.D. (Med. Coll. of Virginia, 1978); Alfred G. Windham, M.D. (Mississippi, 1979).

Assistant Residents: Berrylin J. Ferguson, M.D. (Duke, 1980); Gerald S. Gussack, M.D. (Georgia, 1979); Jay L. Lucas, M.D. (Med. Coll. of South Carolina, 1979); Robert Remondino, M.D. (Oklahoma, 1980); George A. Toledo, M.D. (Texas Southwestern, 1980); Bradford C. Winegar, M.D. (Texas Southwestern, 1980).

Research Fellow: Bjorn Carlborg, M.D. (Univ. of Lund, 1973).

DIVISION OF PLASTIC AND MAXILLOFACIAL SURGERY

Instructors and Chief Residents: Carlos R. Planell, M.D. (Zaragoza Med. School), 1975); Vincent E. Voci, M.D. (Louisville, 1974).

Assistant Residents: Mary E. Beatty, M.D. (South Florida, 1977); Michael L. Farkas, M.D. (Univ. of Zurich, 1974); Guido P. Gutter, M.D. (Zurich, 1977); B. Thomas Harter, M.D. (Georgetown, 1975); Howard W. Klein, M.D. (Louisville, 1977); Carl H. Manstein, M.D. (Temple, 1976); Thomas J. Sanzaro, M.D. (Georgetown, 1977); Richard K. Vanik, M.D. (Illinois, 1977).

DIVISION OF UROLOGIC SURGERY

Instructors and Chief Residents: G. Byron Hodge, M.D. (Duke, 1977); Richard B. Koefoot, Jr., M.D. (Nebraska, 1977); Gordon L. Mathes, Jr., M.D. (Tennessee, 1976).

Assistant Residents: Robert A. Bertram, M.D. (Kentucky, 1980); Michael W. Brown, M.D. (Northwestern, 1980); Paul W. F. Coughlin, M.D. (North Carolina at Chapel Hill, 1978); Fred E. Govier, M.D. (Nebraska, 1979); Richard J. Mynatt, M.D. (Tennessee at Memphis, 1977); John A. Nesbitt II, M.D. (Louisville, 1980); Tom E. Nesbitt, Jr., M.D. (Georgetown, 1978); Cary N. Robertson, M.D. (Tulane, 1977).

Research Fellows: Bor-Shuh Cheng, M.D. (Chung Shan, Taiwan, 1973); Amid S. ElMahrousky, M.Sc. (Tanta Univ., 1979).

Roster of Students

Class of 1983

Adams, David H. (Duke), Greensboro, North Carolina
Adler, Stuart (Harvard), Statesville, North Carolina
Andrews, Danny F. (Duke), Mt. Olive, North Carolina
Auten, Grace McCall (North Carolina State), Marion, North Carolina
Baker, Joseph W. (Duke), Frederick, Maryland
Bass, Eric B. (Duke), Shaker Heights, Ohio
Beard, David C. (Davidson), York, South Carolina
Bernard, Estrada J., Jr. (Morehouse), Monrovia, Liberia
Boatman, James Edward (Southern California), Claremont, California
Brame, Robert G., Jr. (North Carolina at Chapel Hill), Greenville, North Carolina
Brennan, Terry E. (Harvard), Munster, Indiana
Bridges, R. McIntyre, Jr. (Texas Christian), Minden, Louisiana
Brown, Tracey M. (Swarthmore), Summit, New Jersey
Buhrman, William C. (Duke), Richmond, Virginia
Butler, Wendell D. (Duke), Charlotte, North Carolina
Campos, Christian T. (Dartmouth), Worcester, Massachusetts
Cheshire, McKinley, III (California at San Diego), West Palm Beach, Florida
Chu, H. Willy (Duke), Raleigh, North Carolina
Collier, Thomas F. (Cornell), Closter, New Jersey
Cooper, Michael R. (Duke), Winston-Salem, North Carolina
Corsa, Ann Teresa (Brown), Farmingdale, New York
Crawford, James M. (Dartmouth), Fairfield, Connecticut
Cummings, Robin G. (North Carolina at Chapel Hill), Pembroke, North Carolina
Curiel, Tyler J. (Georgia), Douglasville, Georgia
Custis, Peter H. (Northwestern), Potomac, Maryland
D'Agostino, Harry J., Jr. (Harvard), Menands, New York
Deaton, David Wayne (Davidson), Valdese, North Carolina
Dodson, William W., III (Emory), Atlanta, Georgia
Dolmatch, Bart Lewis (Michigan), Peekskill, New York
Drake, Almond J., III (U.S. Naval Academy), Pinetops, North Carolina
Eichenholz, Philip W. (Duke), St. Clair Shores, Michigan
Farrar, Ann H. (North Carolina at Chapel Hill), Norlina, North Carolina
Frederick, Lauretta S. (Duke), Rock Hill, South Carolina
Freedman, Bruce M. (Duke), Alexandria, Virginia
French, Whitney J. (Overland), Chapel Hill, North Carolina
Fulghum, Thomas G. (Wake Forest), Sims, North Carolina
Gallalee, John A. (Duke), Mobile, Alabama
Gichner, Lisa Ann (Brown), Bethesda, Maryland
Glatt, Herbert J. (Pennsylvania), Carmel, New York
Glaubitz, Linda (Cornell), Floral Park, New York
Glover, Michael Griffin (Duke), Wilson, North Carolina
Gomez, Patrick (California at Irvine), Presidio of San Francisco, California
Gottesman, William L. (Dartmouth), Scarsdale, New York
Haas, Mark (Duke), Floral Park, New York
Hall, Gregory G. (Duke), Greensboro, North Carolina
Hall, Reginald L. (St. Vincent College), Baltimore, Maryland
Hall, Sherry Lene (Duke), Snow Hill, North Carolina
Hambright, Wesley F. (Emory), Greensboro, North Carolina
Hamilton, Stephen C. (Duke), Pittsburgh, Pennsylvania
Handy, John R., Jr. (Georgia), Augusta, Georgia
Harland, Paula Kadison (Davidson), Tallahassee, Florida
Harland, Robert C. (Whitworth), Lake Oswego, Oregon
Hazel, William Andrew, Jr. (Princeton), Broad Run, Virginia
Hensley, Michele I. (Duke), Raleigh, North Carolina
Hiatt, Karl B. (Arizona State), Mesa, Arizona
Holleman, Donald R., Jr. (Arizona), Phoenix, Arizona
Hooper, William E. (North Carolina at Chapel Hill), Ruxton, Maryland
Janick, Peter A. (Cornell), West Lafayette, Indiana
Jordan, Joan T. (Duke), Raleigh, North Carolina
Kaelin, William G., Jr. (Duke), Fairfield, Connecticut
Karas, Steven P. (Columbia), Brooklyn, New York
Katz, David L. (Duke), Chapel Hill, North Carolina

Kay, Gary (Michigan), Northbrook, Illinois
 Kier, Ruben (Harvard), Charlotte, North Carolina
 Kitzmiller, William J. (Duke), Cincinnati, Ohio
 Knauer, Hope E. (Purdue), Cherry Hill, New Jersey
 Koehler, Mary Frances (Michigan), Northville, Michigan
 Komrad, Mark S. (Yale), Coral Gables, Florida
 Kraus, Virginia Byers (Brown), Cleveland, Ohio
 Kraus, William E. (Harvard), Akron, Ohio
 Kylstra, Jan A. (Dartmouth), Durham, North Carolina
 Lane, Julia C. (Duke), Pensacola, Florida
 Lease, John G. (North Carolina State), Raleigh, North Carolina
 Levine, Steven J. (California at San Diego), Northridge, California
 Ling, Mark (Harvard), Meriot, Pennsylvania
 Lingle, James (North Carolina at Chapel Hill), Charlotte, North Carolina
 Lucore, Charles L. (Colgate), Cheshire, Connecticut
 Marino, Philip A. (LaSalle), New Britain, Pennsylvania
 McBride, Jack M., Jr. (Wofford), Columbia, South Carolina
 McGowan, Francis X., Jr. (Brown), New York, New York
 Mendelow, Lawrence G. (Duke), Pittsburgh, Pennsylvania
 Miller, Deevide O. (Morehouse), Hodges, South Carolina
 Miller, Karen Hinkley (North Carolina at Chapel Hill), Raleigh, North Carolina
 Miller, Katherine E. (Duke), St. Petersburg, Florida
 Miller, Leon (Sterling), Partridge, Kansas
 Mitchell, Adele Z. (Harvard/Radcliffe), Denton, Texas
 Morrison, Mary Claire (McGill), Bound Brook, New Jersey
 Morse, Martin A. (Duke), Bethesda, Maryland
 Mumma, Michael (Duke), Orefield, Pennsylvania
 Murrah, Robert L., Jr. (Duke), Conyers, Georgia
 Neal, Jan Angela (Tennessee), Durham, North Carolina
 Oshrain, Mindy (Brown), Rochester, New York
 Ow, Cathy L. (California at Los Angeles), Honolulu, Hawaii
 Parelman, Joseph J. (Duke), Prairie Village, Kansas
 Peterson, Caroline (Marquette), Bloomington, Minnesota
 Pisano, Etta D. (Dartmouth), Flourtown, Pennsylvania
 Porges, Reuven (Duke), Rishon Le'Zion, Israel
 Quinn, David E. (Amherst), Delmar, New York
 Reiman, Threasa H. (Duke), Montgomery, Alabama
 Rein, Mitchell S. (Duke), Livingston, New Jersey
 Richardson, Margaret G. (East Tennessee State), Fayetteville, North Carolina
 Roberts, Michelle M. (Brown), Scarsdale, New York
 Robinson, David (Duke), Medford, New Jersey
 Sane, David C. (Wake Forest), Rutherfordton, North Carolina
 Sarner, Richard A. (Duke), Merrick, New York
 Schaten, Robin L. (Cornell), Englewood, Colorado
 Sheerin, Kathleen A. (Mt. Holyoke), New Bedford, Massachusetts
 Stevens, Scott D. (Dartmouth), Lexington, Kentucky
 Thames, Thomas B., II (Duke), Orlando, Florida
 Tweed, Jonathan N. (Florida), Ormond Beach, Florida
 Wain, Stephanie L. (Tufts), Verona, New Jersey
 Walden, Lesa Denise (Dartmouth), South Orange, New Jersey
 Ware, Russell E. (Furman), Orlando, Florida
 Weisman, Joseph S. (U.S. Air Force Academy), Providence, Rhode Island
 Willett, Grace A. (Bowdoin), Raleigh, North Carolina
 Wood, Stacey A., Jr. (North Carolina at Chapel Hill), Wilson, North Carolina
 Yancey, Antronette K. (Northwestern), Kansas City, Kansas

Class of 1984

Adams, Marsha (Duke), Malvern, Pennsylvania
 Adams, Renee E. (Duke), Hiddenite, North Carolina
 Albert, David B. (Stanford), LaGrange, Illinois
 Alitz, Curtis J. (United States Military Academy), West Point, New York
 Allen, Susan A. (Duke), Durham, North Carolina
 Amoroso, Kathy (Northwestern), Vienna, Virginia
 Anderson, Russell D. (Williams), Barrington, Illinois
 Anthony, Douglas C. (Washington), Hermitage, Missouri
 Artis, Avis A. (North Carolina Central), Faison, North Carolina

Baker, Jeffrey P. (Duke), Atlanta, Georgia
 Barrett, Lynn (Duke), Birmingham, Michigan
 Baum, Linda G. (Stanford), Shaker Heights, Ohio
 Benyunes, Mark C. (Vanderbilt), Morehead City, North Carolina
 Bonner, Jocelyn W. (Spelman), Hampton, Virginia
 Buncke, Geoffrey H. (California at Davis), Hillsborough, California
 Buse, John B. (Dartmouth), Charleston, South Carolina
 Carr, William C. (Davidson), Clinton, North Carolina
 Chancellor, Karen (Memphis), Memphis, Tennessee
 Chang, Jonathan L. (Michigan), Okemos, Michigan
 Chen, Allen R. S. (Dartmouth), Lexington, Massachusetts
 Clinton, Catherine A. (Duke), Glastonbury, Connecticut
 Coin, James T. (Oklahoma City), Fayetteville, North Carolina
 Cover, Timothy L. (Muhlenberg), Myerstown, Pennsylvania
 Crutcher, Kenneth L. (Georgia), Atlanta, Georgia
 Csorba, Amy R. (Case Western Reserve), Annapolis, Maryland
 Dietz, John W. (United States Military Academy), Spokane, Washington
 Dresser, Michael (Duke), Davidson, North Carolina
 Dunnmon, Preston M. (Duke), Fayetteville, North Carolina
 Early, Mary E. (Asbury), Sarasota, Florida
 Ellison, David M. (Yale), Charleston, South Carolina
 Erickson, Lars C. (Brown), Hillsborough, North Carolina
 Feldman, David L. (Duke), Woodmere, New York
 Feldman, Steven R. (Chicago), Silver Spring, Maryland
 Fuchs, Herbert E. (California at Los Angeles), Granada Hills, California
 Galloway, Marc T. (North Carolina at Chapel Hill), Concord, North Carolina
 Gellman, Randy L. (Northwestern), Mooresville, North Carolina
 George, Gregory S. (Massachusetts Inst. of Tech.), Bronx, New York
 Germino, Joseph (Holy Cross), Palo Park, Illinois
 Gibson, James B. (California at Davis), San Francisco, California
 Gonias, Steven L. (New York-Stony Brook), Brooklyn, New York
 Griffeth, Landis King (Duke), Greenville, South Carolina
 Grossman, Rachel M. (Duke), Teaneck, New Jersey
 Hall, David H. (Duke), Potomac, Maryland
 Hall, Samuel (Johns Hopkins), Silver Spring, Maryland
 Harris, Sally S. (Dartmouth), Atherton, California
 Harris, Steven G. (Duke), Daytona Beach, Florida
 Hatcher, Paul A. (Cornell), Hudson, Ohio
 Havlir, Diane V. (St. Olaf), Park Ridge, Illinois
 Hill, Joseph A., Jr. (Wake Forest), Burlington, North Carolina
 Hillery, Cheryl Ann (Wisconsin), Grant, Wisconsin
 Hjelmstad, Russell (Colorado), Englewood, Colorado
 Howell, David N. (Duke), Greenville, North Carolina
 Hull, Jeffrey E. (Colorado), Greenwich, Connecticut
 Iruela, Maria E. (Duke), Winston-Salem, North Carolina
 Jackson, Andrea M. (Tufts), Washington, District of Columbia
 Jackson, Fiona S. (Rice), Houston, Texas
 Jackson, J. Leigh (Denison), Weston, Massachusetts
 James, Walter S., III (Duke), Atlanta, Georgia
 Jester, Joy D. (North Carolina at Chapel Hill), Asheboro, North Carolina
 Jetmore, Allen B. (Westminster), Parkville, Missouri
 Johnson, Michael E. (Brigham Young), Mesa, Arizona
 Johnston, James M. (Duke), Greensboro, North Carolina
 Jones, Janet McCauley (North Carolina at Chapel Hill), Burlington, North Carolina
 Joslyn, Ann K. (Vassar), Roanoke, Virginia
 Kiernan, David C. (Duke), Key Biscayne, Florida
 Knox, James B. (Virginia), Wilmington, Delaware
 Kokenes, Constantine (Duke), Charlotte, North Carolina
 Kubek, Bonnie L. (Miami), Cleveland Heights, Ohio
 Kupke, Kenneth G. (Stanford), Hickory, North Carolina
 Kurilla, Michael G. (California Inst. of Tech.) Trenton, New Jersey
 Laforet, Genevieve (Harvard/Radcliffe), Chestnut Hill, Massachusetts
 Layton, Marcelle C. (Maryland), Baltimore, Maryland
 Lazarus, Kenneth J. (Massachusetts Inst. of Tech.), North Miami Beach, Florida
 Leiter, Jeffrey D. (Harvard), Englewood, Colorado
 Litaker, David G. (Davidson), Charlotte, North Carolina
 Livingston, Elizabeth G. (Harvard), Birmingham, Alabama

Lobach, David H. (Bucknell), York, Pennsylvania
 Locklear, J. C. (Pembroke), Pembroke, North Carolina
 McCall, William V. (Duke), Winston-Salem, North Carolina
 McCann, Una D. (Princeton), Portland, Maine
 McDonald, William M. (Duke), Raleigh, North Carolina
 McNamara, Michael J. (Johns Hopkins), Philadelphia, Pennsylvania
 McNeill, Robert E. (North Carolina State), West Jefferson, North Carolina
 Madden, John F. (Amherst), New Britain, Connecticut
 Mallon, William J. (Duke), Rock Falls, Illinois
 Massad, Leslie S. (Williams), Manlius, New York
 Matson, Linda K. (Williams), Schenectady, New York
 Mawhorter, Steven S. (Wheaton), Cincinnati, Ohio
 Michel, Thomas M. (Harvard), Cranston, Rhode Island
 Moore, Karen Anne (Spelman), Durham, North Carolina
 Moore, Lucy D. (Georgetown), Littleton, Colorado
 Moreadith, Randall (North Carolina State), Leland, North Carolina
 Nevett, Robert E., III (Duke), Hudson, Ohio
 Newton, Joseph R., Jr. (North Carolina at Chapel Hill), Wilson, North Carolina
 Ney, Kathryn A. (Pittsburgh), Pittsburgh, Pennsylvania
 O'Donnell, Michael A. (Northwestern), Alexandria, Virginia
 Page, Richard L. (Duke), Chapel Hill, North Carolina
 Pegues, Robert F. (Cornell), Columbus, Ohio
 Penny, Wade H., III (North Carolina at Chapel Hill), Durham, North Carolina
 Pike, Marilyn C. (Duke), Durham, North Carolina
 Piwnica-Worms, David R. (Stanford), Excelsior, Minnesota
 Porter, Kevin R. (Morehouse), Atlanta, Georgia
 Quansah, Felicity A. (Duke), Accra, Ghana
 Rabkin, Michael G. (Massachusetts Inst. of Tech.), Marblehead, Massachusetts
 Rajan, Narain P. (Maryland), Gaithersburg, Maryland
 Reynolds, Pamela Preston (Duke), Akron, Ohio
 Rich, John A. (Dartmouth), Bayside, New York
 Roberts, Kenneth B. (Massachusetts Inst. of Tech.), Westport, Connecticut
 Ross, Glen (Duke), Rockville Centre, New York
 Rustgi, Anil K. (Yale), Williamsville, New York
 Saltz, Joel (Michigan), Detroit, Michigan
 Saltzman, Andrew (Princeton), Bloomington, Indiana
 Schanberg, Laura E. (Harvard), Durham, North Carolina
 Schmidt, David M. (Northwestern), Cascade, Wisconsin
 Schneider, Michael G. (Geneva), Edinboro, Pennsylvania
 Scroggs, Mark W. (Trinity), Durham, North Carolina
 Seabolt, Sarah J. (North Carolina at Chapel Hill), Greensboro, North Carolina
 Selin, Karen L. (Bates), Locke Mills, Maine
 Shearin, William A., Jr. (North Carolina at Chapel Hill), Cary, North Carolina
 Shore, Neal (Duke), Matawan, New Jersey
 Short, Timothy B. (Duke), Pittsburgh, Pennsylvania
 Silberman, Michael K. (Duke), Durham, North Carolina
 Small, James M. (Colorado), Englewood, Colorado
 Smith, Lyman S. W. (Duke), Klamath Falls, Oregon
 Spector, Rona (Cornell), New York, New York
 Stambler, Bruce (Duke), Woodmere, New York
 Stave, Gregg Martin (Massachusetts Inst. of Tech.), Manhasset Hills, New York
 Stephens, Paul, Jr. (Dartmouth), East Orange, New Jersey
 Stoneburner, Sara E. (Davidson), Danville, Virginia
 Strader, David J. (Virginia), Alexandria, Virginia
 Tanaka, Taro (Williams), Minneapolis, Minnesota
 Tatum, Emily J. (Asbury), Toccoa, Georgia
 Tobin, Jayne E. (Washington University), Dyersville, Iowa
 Treseler, Patrick H. (Seattle), Seattle, Washington
 Vance, Jeffrey M. (Puget Sound), Chapel Hill, North Carolina
 Vandeven, Andrea M. (Yale), North Syracuse, New York
 Velaj, Richard H. (Wesleyan), Greenwich, Connecticut
 Vickrey, Barbara G. (Vanderbilt), Murfreesboro, Tennessee
 Volpp, Bryan D. (Williams), Fresno, California
 Vu, Minh T. (Columbia), Rego Park, New York
 Walker, Cheryl L. (Duke), Mebane, North Carolina
 Walsh, James P. (Mississippi), Montgomery, Alabama
 Westry, Jeanie A. (Georgetown), Rockville, Maryland

Whitehouse, Paula K. (North Carolina State), Raleigh, North Carolina
 Winter, Thomas Charles, III (Duke), Springfield, Virginia
 Wolfe, James A. (North Carolina at Chapel Hill), Charlotte, North Carolina
 Wood, Lauren V. (Oberlin), Silver Spring, Maryland
 Wormser, Randall J. (Wooster), Shaker Heights, Ohio
 Wright, Martha S. (Mt. Holyoke), Syosset, New York
 Zeitler, Philip Scott (Amherst), Malden, Massachusetts

Class of 1985

Adams, Carol J. (Virginia Polytech. Inst.), Martinsville, Virginia
 Allen, Cathy M. (William and Mary), Brookline, Massachusetts
 Atwater, Susan K. (Duke), Blue Bell, Pennsylvania
 Baker, Dorothy D. (Pennsylvania), McAfee, New Jersey
 Barboriak, Peter N. (Marquette), Wood, Wisconsin
 Beck-Davis, Susan Ruth (Duke), Durham, North Carolina
 Bernstein, Roslyn J. (Johns Hopkins), New York, New York
 Bobman, Stuart A. (Duke), Lafayette Hill, Pennsylvania
 Bousvaros, Athos (Williams), Slingerlands, New York
 Bradford, Norman F. (Duke), Miami, Florida
 Brorain, William J., Jr. (Gettysburg), Whippany, New Jersey
 Brown, Richard A. (Duke), Atlanta, Georgia
 Calby, Ann M. (Duke), Midland, Michigan
 Capps, John L. (Wake Forest), Warrenton, North Carolina
 Caruso, Joseph M. (Southern California), South Holland, Illinois
 Chaney, Kathy Santoriello (Virginia Polytech. Inst.), West Mifflin, Pennsylvania
 Chung, Sophia M. (Duke), Silver Spring, Maryland
 Coggin, Robin R. (Duke), Chapel Hill, North Carolina
 Cornwell, Sarah B. (North Carolina at Chapel Hill), Valdese, North Carolina
 Crowley, Nancy (Wisconsin), Edina, Minnesota
 Daft, Paula A. (Duke), Lafayette Hill, Pennsylvania
 Deaton, David H. (Haverford), Hickory, North Carolina
 Dickinson, Daniel J. (Virginia), Virginia Beach, Virginia
 Doman, Kathleen A. (Duke), Asheboro, North Carolina
 Dranoff, Glenn (Duke), Woodmere, New York
 Drapkin, Meredith (Duke), Riverdale, New York
 Dunkel, Ira J. (Johns Hopkins), Paramus, New Jersey
 Ebeling, James G. (Haverford), Baltimore, Maryland
 Enright, Katherine A. (Kansas), Durham, North Carolina
 Fearnow, Edgar C., III (Duke), Lancaster, Pennsylvania
 Flanagan, William F. (Davidson), Lakeland, Florida
 Freye, Christopher J. (Duke), Stonington, Connecticut
 Friedman, Daniel B. (Amherst), Albuquerque, New Mexico
 Frush, Donald P. (California at Davis), Los Gatos, California
 Gibbons, Virginia N. (Smith), Concord, Tennessee
 Gilbertson, John R., II (Massachusetts Inst. of Tech.), Lynnfield, Massachusetts
 Glover, Gregory J. (Harvard), Blythewood, South Carolina
 Gotlib, Louis J. (Johns Hopkins), Bangor, Maine
 Gray, John L. (Westminster), Lewisburg, Pennsylvania
 Greenfield, Ruth A. (Duke), Durham, North Carolina
 Gulevich, Steven J. (Stanford), Stanford, California
 Harbury, Olin L. (Massachusetts Inst. of Tech.), Etna, New Hampshire
 Holcomb, Gerianne C. G. (Kent State), Cary, North Carolina
 Jackson, Mark D. (Wisconsin), Middleton, Wisconsin
 Jenkins, Susan E. (Pennsylvania), Philadelphia, Pennsylvania
 Jones, Elizabeth C. (Georgetown), Bethesda, Maryland
 Jones, Vincent T. (United States Air Force Academy), Arapahoe, North Carolina
 Kabas, John S. (North Carolina at Chapel Hill), Raleigh, North Carolina
 Keppel, Kenneth P. (North Carolina at Chapel Hill), Hickory, North Carolina
 King, Peter H. (Duke), Canton, Ohio
 Kipnis, Robert J. (Brown), Clayton, Missouri
 Kirkland, Kathryn B. (Mount Holyoke), Charleston, South Carolina
 Kleiner, Jillian (Amherst), Larchmont, New York
 Klierer, Mark A. (Oberlin), Mt. Pleasant, South Carolina
 Leonardy, Nicholas J. (Duke), Atlanta, Georgia
 Levine, Pamela D. (Emory), Atlanta, Georgia
 Lewis, William R., III (California at Davis), Carmel, California

Louden, Mark S. (Duke), Parkersburg, West Virginia
 Maroon, Thomas J., Jr. (Duke), Wheeling, West Virginia
 McFarland, Elizabeth J. (Northwestern), Wauwatosa, Wisconsin
 Menick, Barry J. (Duke), Rockville, Maryland
 Mitchell, R. Brian (Duke), Columbus, Ohio
 Murray, Michael J. (Vanderbilt), Durham, North Carolina
 Mustoe, Thomas A. (Harvard), Covington, Virginia
 Myers, Margaret A. (Duke), Allison Park, Pennsylvania
 Newby, Stephanie F. (North Carolina State), Greensboro, North Carolina
 Nichols, Joni C. (Dartmouth), Oak Brook, Illinois
 Nichols, Stephen R. (Massachusetts Inst. of Tech.), Magnolia, Texas
 Papanicolaou, Michael N. (Duke), Lighthouse Point, Florida
 Paulson, Erik K. (Colorado), Columbus, Ohio
 Perkins, Christopher M. (Lafayette), Darien, Connecticut
 Petraska, David B. (Georgetown), Wilmington, Delaware
 Pharr, Walter D. (Davidson), Greensboro, North Carolina
 Pierce, Lori J. (Pennsylvania), Philadelphia, Pennsylvania
 Pomper, Mark E. (Dartmouth), Wilmette, Illinois
 Porter, Kathleen L. (Wesleyan), Weston, Massachusetts
 Rabassa, Antonio E. (Georgetown), Key Biscayne, Florida
 Rajagopalan, Shrinivas (Harvard), Durham, North Carolina
 Reid, Steven H. (North Carolina at Chapel Hill), Salisbury, North Carolina
 Reiser, Harvey J. (Michigan), Minnetonka, Minnesota
 Rossitch, Eugene, Jr. (North Carolina at Chapel Hill), Winston-Salem, North Carolina
 Sherrier, Robert H. (Princeton), Brielle, New Jersey
 Shortridge, Beth Ann (Princeton), Atlanta, Georgia
 Sierra, Leslie C. (Duke), Miami, Florida
 Silverstein, Jonathan S. (Duke), Port Washington, New York
 Slater, Douglas K. (William and Mary), Cape Coral, Florida
 Smalley, Walter E., Jr. (Emory and Henry), Kingsport, Tennessee
 Smith, Stephen R. (Dartmouth), Parkersburg, West Virginia
 Sobol, Warren M. (North Carolina at Chapel Hill), Wilmington, North Carolina
 Spain, Claire L. (Washington), Chicago, Illinois
 Sperduto, Paul W. (Duke), Westfield, New Jersey
 St. Peter, Robert F. (Kansas), Wichita, Kansas
 Suh, Eall Joo (Smith), Morganton, North Carolina
 Takla, Medhat W. (North Carolina at Chapel Hill), Raleigh, North Carolina
 Taylor, Dean C. (United States Military Academy), Livonia, Michigan
 Thompson, John P. (Duke), St. Petersburg, Florida
 Trellis, Dan R. (Brown), Pittsburgh, Pennsylvania
 Treseler, Catherine P. B. (Seattle), Durham, North Carolina
 Tripathy, Debasish (Massachusetts Inst. of Tech.), New Orleans, Louisiana
 Tripp, Henry, Jr. (North Carolina at Chapel Hill), Greensboro, North Carolina
 Trippett, Tanya M. (Spelman), Mountain Home, Idaho
 Tsai, Joseph C. (Harvard), Rocky River, Ohio
 Umhau, Andrew N. (Davidson), Chevy Chase, Maryland
 Veronee, Charles D. (Charleston), Summerville, South Carolina
 Wang, Henry Z. (Northwestern), Pittsburgh, Pennsylvania
 Warner, Charles H. (Washington and Lee), Charlotte, North Carolina
 Weston, Brent W. (Duke), Durham, North Carolina
 Wiley, James F., II (Duke), Raleigh, North Carolina
 Willett, Ralph P. (Williams), Raleigh, North Carolina
 Windom, Hugh H. (Duke), Sarasota, Florida
 Wright, Bryan T. (North Carolina at Chapel Hill), Raleigh, North Carolina
 Wyatt, Richard M. (Washington), Calhan, Colorado

Class of 1986

Aldrich, Harry R. (Princeton), Flushing, New York
 Allf, Bryan Ewing (Duke), Cincinnati, Ohio
 Alster, Tina S. (Duke), Durham, North Carolina
 Amidon, Thomas A. (Duke), Advance, North Carolina
 Barton, John W., III (Duke), Rocky River, Ohio
 Bassett, Victoria Mayer (Cornell), Miami, Florida
 Busak, William L. (Cornell), Gloversville, New York
 Bernhardt, Peter F. (Massachusetts Inst. of Technology), Dedham, Massachusetts
 Blow, Osbert (Columbia), New York, New York

Bolick, David R. (Brigham Young), Provo, Utah
 Branum, Gene D. (Austin), Tyler, Texas
 Burke, Deborah M. (Florida), Durham, North Carolina
 Carle, Kenneth A. (Hobart), Geneva, New York
 Chen, Anthony L. (Michigan), Ann Arbor, Michigan
 Coles, Neavelle A., Jr. (Johns Hopkins), Lanham, Maryland
 Craig, Kendra A. (Michigan), Anchorage, Alaska
 Crone, Wilson (Duke), Charleston, South Carolina
 Crowell, Bradford A., Jr. (Pennsylvania), Hollywood, Florida
 Darwin, Robert H. (Duke), Plainfield, New Jersey
 DeWeese, Gary K. (Duke), Graham, North Carolina
 Duffy, Patrick (United States Military Academy), Hampton, Virginia
 Ellenby, Martin I. (Illinois), Skokie, Illinois
 Fabian, Michael A. (Hamilton), Vestal, New York
 Fawcett, Thomas A. (Massachusetts Inst. of Technology), Wrightsville Beach, North Carolina
 Feldmesser, Marta L. (Radcliffe), Woodmere, New York
 Fisher, Bret L. (Duke), Winter Park, Florida
 Forsberg, David A. (Princeton), Wyckoff, New Jersey
 Friedberg, Richard C. (Stanford), Longboat Key, Florida
 Fritz, Russell C. (Duke), Clark, New Jersey
 Furr, William S. (North Carolina State), Charlotte, North Carolina
 Gartrell, Douglas M. (Oregon State), Lake Oswego, Oregon
 Gates, Lawrence K., Jr. (Utah State), Logan, Utah
 Givens, Kerry T. (Bucknell), Harrisburg, Pennsylvania
 Glasson, Sandra E. (Virginia), Charlottesville, Virginia
 Glaze, Karen P. (Georgia Inst. of Technology), Doraville, Georgia
 Gonzalez, Alexander E. (Duke), Durham, North Carolina
 Gore, Margaret (Harvard), Birmingham, Alabama
 Grady, Tana A. (Howard), Teaneck, New Jersey
 Green, Richard M. (Duke), Flossmoor, Illinois
 Haleem, Azeem S. (Duke), London, Ohio
 Hamilton, Karen S. (Pittsburgh), Beaver Falls, Pennsylvania
 Harvill, Paul G. (Texas A. & M.), Garland, Texas
 Haynes, William L. (Duke), Millers Creek, North Carolina
 Hern, Deborah S. (Franklin and Marshall), Lancaster, Pennsylvania
 Hillman, David S. (Yale), Columbus, Ohio
 Hovis, John G. (Duke), Cary, North Carolina
 Howard, Joseph F. (Duke), Rockville, Maryland
 Howell, Scott T. (Washington and Lee), Chester, Virginia
 Hoyt, David J. (Fairfield), Stratford, Connecticut
 Hulka, Carol A. (Brown), Chapel Hill, North Carolina
 Huot, Stephen J. (Saint Michael's), Bethesda, Maryland
 Johnson, Janice D. (Loyola), Upper Marlboro, Maryland
 Johnson, Scott H. (Emory), St. Louis, Missouri
 Kallianos, John A. (North Carolina at Chapel Hill), Clyde, North Carolina
 Kerr, Lindsey U. (Duke), Brookline, Massachusetts
 Koenig, Daniel W. (Duke), Potomac, Maryland
 Kubek, Robert J. (Miami), Cleveland, Ohio
 Lambert, Thomas L. (Brigham Young), Fairfax, Virginia
 Lebovitz, Daniel J. (Washington), Durham, North Carolina
 Lindegren, Mary Lou (Duke), Riverside, Connecticut
 Long, Joseph B. (Duke), Kingsport, Tennessee
 Lyon, Robert K. (Duke), Westfield, New Jersey
 Martin, Barbara (Duke), Cary, Illinois
 Martin, Pamela H. (Princeton), Rego Park, New York
 McAdams, Holman P. (North Carolina State), Greensboro, North Carolina
 McDonough, Robert S. (Texas), Bloomington, Minnesota
 McGough, James J. (Gettysburg), Durham, North Carolina
 Merritt, Kathy A. (Duke), Durham, North Carolina
 Mills, Anthony M. (Duke), Columbia, South Carolina
 Minor, Robert L., Jr. (Duke), Rocky Mount, North Carolina
 Molter, David W. (Duke), Durham, North Carolina
 Morgan, Bruce K. (Duke), Raleigh, North Carolina
 Moskaluk, Christopher A. (Illinois), Midlothian, Illinois
 Murry, Charles E. (North Dakota), Bismarck, North Dakota
 Nelson, Stanley F. (Michigan), Englewood, Colorado
 Patel, Dhavalkuma D. (Duke), Charlotte, North Carolina

Ping, Andrew C. (Brown), Athens, Ohio
 Preiss, Jennifer E. (California at Berkeley), Davis, California
 Prifty, Karen R. (Duke), Naugatuck, Connecticut
 Query, Charles C., Jr. (Duke), Kannapolis, North Carolina
 Raskauskas, Paul A. (Harvard), South Boston, Massachusetts
 Reiner, Steven L. (Haverford), Utica, New York
 Roberts, Kathleen T. (Georgia), Columbus, Georgia
 Rosemond, Richard L. (Duke), Sanford, Florida
 Rosenberg, Mark R. (Duke), Gastonia, North Carolina
 Ruh, Jennifer M. (Dartmouth), Orchard Park, New York
 Sheffield, Cedric D. (Florida State), DeFuniak Springs, Florida
 Sidhu, Navjeet K. (Wellesley), Winston Salem, North Carolina
 Silver, Jon M. (Duke), Plantation, Florida
 Singh, Jasjit (Radcliffe), Brookville, New York
 Sjaarda, Raymond N. (Michigan), Marshall, Michigan
 Slaughter, Shelley R. (Michigan State), Raleigh, North Carolina
 Smith, Michael A. (North Carolina at Charlotte), Charlotte, North Carolina
 Sommers, Jefferson M. (North Carolina at Chapel Hill), Fayetteville, North Carolina
 Spach, David H. (Virginia), Durham, North Carolina
 Spaulding, Cora D. (Stanford), Chicago, Illinois
 Stacy, George P., Jr. (Purdue), Prospect, Kentucky
 Sugarman, Jeremy (Duke), Paramus, New Jersey
 Sumner, Alice E. (Duke), Concord, North Carolina
 Sutherland, Frederick S. (East Tennessee State), Johnson City, Tennessee
 Sutphin, Loretta G. (Wake Forest), Walnut Cove, North Carolina
 Szabo, Eva (Yale), Merrick, New York
 Taylor, Christina C. (California at Los Angeles), Corvallis, Oregon
 Troutman, James L. (Davidson), Moorestown, New Jersey
 Uraizee, Ashfaq (Duke), Charlotte, North Carolina
 Van Vickle, Jennifer (Chicago), Durham, North Carolina
 Vilasi, Vincent J. (Pennsylvania), Dix Hills, New York
 Welty, Karen E. (Davidson), St. Petersburg, Florida
 Whitney, Winston S. (Bowdoin), Cape Elizabeth, Maine
 Wilkes, David C. (Columbia), Dresher, Pennsylvania
 Williams, Carmen J. (Duke), Poughkeepsie, New York
 Williams, Richard F., Jr. (North Carolina at Chapel Hill), Beulaville, North Carolina
 Wilson, Deborah Y. L. (Drake), Chicago, Illinois
 Wise, Andrew E. (Harvard), New Canaan, Connecticut
 Young, Jacob N. (Florida State), Tallahassee, Florida
 Youngblood, Martha M. (Duke), Springfield, Virginia

Class of 1982 with Internship Appointments

Ackermann, Richard John (Sumter, South Carolina) Naval Regional Medical Center, Charleston, South Carolina—Family Practice
 Anderson, Donna Grey (Lumberton, North Carolina) University of Texas at Southwestern, Dallas, Texas—Pediatrics
 Anderson, Scott J. (Long Beach, California) Barnes Hospital, St. Louis, Missouri—Internal Medicine
 Austin, Michael (Chamblee, Georgia) Grady Memorial Hospital, Atlanta, Georgia—Internal Medicine
 Barden, Graham A. (New Bern, North Carolina) Vanderbilt University, Nashville, Tennessee—Pediatrics
 Bell, Edwin Lillington (New Bern, North Carolina) Albany Medical Center Affiliated Hospitals, Albany, New York—Internal Medicine
 Bertics, Gregory M. (Newtown, Connecticut) Harvard Longwood Hospitals, Boston, Massachusetts—Neurology
 Blatchford, James W., III (Newton Square, Pennsylvania) University of Minnesota Hospitals, Minneapolis, Minnesota—Surgery
 Bledsoe, Robert E., Jr. (Greenville, Mississippi) Vanderbilt University, Nashville, Tennessee—Obstetrics and Gynecology
 Bounous, Christine Graham (Durham, North Carolina) Duke University Medical Center, Durham, North Carolina—Internal Medicine
 Bowring, Margaret Ann (Durham, New Hampshire) Children's Hospital, Philadelphia, Pennsylvania—Pediatrics
 Broadhead, Walter E. (Belgian Congo) Duke University Medical Center, Durham, North Carolina—Internal Medicine
 Browder, Timothy Marshall (Charlotte, North Carolina) Baylor College AFL, Houston, Texas—Pediatrics

Browne, Paul C. (Winston-Salem, North Carolina) Medical University of South Carolina, Charleston, South Carolina—Obstetrics and Gynecology

Burge, William R. (Farmville, North Carolina) Bureau of Medicine and Surgery, Navy Department, Washington, D.C.—Internal Medicine

Caffrey, William Daniel, Jr. (Greensboro, North Carolina) University of Pittsburgh, Pittsburgh, Pennsylvania—Orthopedics

Calcagno, David (Greenwich, Connecticut) The New York Hospital, New York, New York—Surgery

Califf, James Christopher (Columbia, South Carolina) Duke University Medical Center, Durham, North Carolina—Orthopedic Surgery

Campbell, Cyd Patrice (St. Petersburg, Florida) Children's Hospital of Northern California, Oakland, California—Pediatrics

Campbell, Elizabeth Estill (Sedalia, Missouri) North Carolina Memorial Hospital, Chapel Hill, North Carolina—Internal Medicine

Cance, William G. (Asheville, North Carolina) Barnes Hospital, St. Louis, Missouri—Surgery

Cantrell, Joyce A. (Jacksonville, Florida) University of Oregon, Portland, Oregon—Emergency Medicine

Carlson, Alan Neil (Berkeley Heights, New Jersey) Baylor College AFL, Houston, Texas—Ophthalmology

Chantry, Caroline Jean (Omaha, Nebraska) North Carolina Memorial Hospital, Chapel Hill, North Carolina—Pediatrics/Medicine

Christopher, Thomas David (Huntington, New York) Duke University Medical Center, Durham, North Carolina—Surgery

Clardy, Elizabeth A. (Arlington, Virginia) Duke University Medical Center, Durham, North Carolina—Family Practice

Cooper, Carnell (Dillon, South Carolina) University of Minnesota, Minneapolis, Minnesota—Surgery

Cox, David Allan (Louisville, Kentucky) Brigham and Women's Hospital, Boston, Massachusetts—Internal Medicine

Crump, Mark A. (Riverhead, New York) Baylor College AFL, Houston, Texas—Internal Medicine

Cunningham, Scott Lance (Newburgh, New York) Duke University Medical Center, Durham, North Carolina—Psychiatry

Dedwylder, Rosier Davis, II (Columbus, Georgia) The Fairfax Hospital of Virginia, Fairfax, Virginia—Family Medicine

Dent, Georgette Amantha (Raleigh, North Carolina) Duke University Medical Center, Durham, North Carolina—Pathology

DiCostanzo, Damian Paul (Canton, Massachusetts) Medical University of South Carolina, Charleston, South Carolina—Internal Medicine

Dove, Samuel Tyrone (Raleigh, North Carolina) University of California Hospitals, San Francisco, California—Anesthesiology

Early, Terrence Stephen (Baring, Missouri) Barnes Hospital, St. Louis, Missouri—Psychiatry

Ellwood, Hilary Kate (Raleigh, North Carolina) Malcolm Grow USAF Hospital, Washington, D.C.—Family Medicine

Emery, Sanford E. (Seligman, New York) Strong Memorial Hospital, Rochester, New York—Orthopedics

Epstein, Ann Rachel (Boston, Massachusetts) Beth Israel Hospital/Harvard Medical School, Boston, Massachusetts—Pediatrics

Ferren, Edwin Louis (Haddonfield, New Jersey) University of Texas Medical Branch, Galveston, Texas—Orthopedics

Fram, Evan (Aspen, Colorado) Duke University Medical Center, Durham, North Carolina—Radiology

Frothingham, Richard (Little Rock, Arkansas) University of Rochester, Rochester, New York—Flexible

Gagliano, Martha E. (Tarpon Springs, Florida) Duke University Medical Center, Durham, North Carolina—Pediatrics

Gilliam, F. Roosevelt, III (Lancaster, South Carolina) Duke University Medical Center, North Carolina—Internal Medicine

Gore, Ira, Jr. (Birmingham, Alabama) University of Alabama, Birmingham, Alabama—Internal Medicine

Grote, Thomas Howard (Charlotte, North Carolina) Vanderbilt University, Nashville, Tennessee—Internal Medicine

Gruber, James E. (Bedford, New York) University of Oregon, Portland, Oregon—Emergency Medicine

Hackel, Andrea (Durham, North Carolina) George Washington University, Washington, D.C.—Internal Medicine

Halverson, James Ramsay (Running Springs, California) General Hospital of Ventura County, Ventura, California—Family Practice

Harris, Stuart I. (Miami, Florida) Duke University Medical Center, Durham, North Carolina—Internal Medicine

Haug, Craig Eric (Normandy Beach, New Jersey)

Haworth, Charles S. (Highpoint, North Carolina) University of Southern California, Los Angeles County, Los Angeles, California—Neurosurgery

Herman, Gail E. (White Plains, New York) Baylor College AFL, Houston, Texas—Pediatrics

Herzog, William Raymond, Jr. (Ellicott City, Maryland) Strong Memorial Hospital, Rochester, New York—Surgery

James, Susan Dara (Durham, North Carolina) Duke University Medical Center, Durham, North Carolina—Radiology

Kappa, Rosanne Denise Pollack (Dayton, Ohio) University of Pennsylvania, Philadelphia, Pennsylvania—Obstetrics and Gynecology

Kernstine, Kemp Howard (Fayetteville, North Carolina) University of Minnesota, Minneapolis, Minnesota—Surgery

Kinney, Robert Bruce (Elgin, Illinois) University of Wisconsin, Madison, Wisconsin—Internal Medicine

Kirschner, Greg Kenneth (North East, Pennsylvania) Lutheran General Hospital, Park Ridge, Illinois—Family Medicine

Kondis, Deborah Jean (Pittsburgh, Pennsylvania) Vanderbilt University, Nashville, Tennessee—Obstetrics and Gynecology

Kopitsky, Robert G. (St. Louis, Missouri) Barnes Hospital, St. Louis, Missouri—Internal Medicine

Leidy, Lu Ann (Lansdale, Pennsylvania) Duke University Medical Center, Durham, North Carolina—Psychiatry

Lewis, Kapauner Ramona (Columbia, South Carolina) Washington University, St. Louis, Missouri—Anesthesiology

Lightner, Virginia Ann (Durham, North Carolina) The New York Hospital, New York, New York—Internal Medicine

Lourie, Gary Mark (Syracuse, New York) Mount Sinai Medical Center, New York, New York—Surgery

Maier, George William (Baltimore, Maryland) Duke University Medical Center, Durham, North Carolina—Surgery

Mainwaring, Richard D. (Allentown, Pennsylvania) University of Virginia Medical Center, Charlottesville, Virginia—Surgery

Markert, Mary Louise (Ogdensburg, New York) Duke University Medical Center, Durham, North Carolina—Pediatrics

Martin, Joseph Henry, Jr. (Durham, North Carolina) Emory University Affiliated Hospital, Atlanta, Georgia—Internal Medicine

McCarley, Meda Elizabeth (Dallas, Texas) Duke University Medical Center, Durham, North Carolina—Internal Medicine

McCrae, Keith Randall (Cumberland Foreside, Maine) Duke University Medical Center, Durham, North Carolina—Internal Medicine

McGowan, Lynn (Madison, Connecticut) Duke University Medical Center, Durham, North Carolina—Pediatrics

McNeill, Diana (St. Petersburg, Florida) University of Arizona, Tucson, Arizona—Internal Medicine

McVicar, John (Broomfield, Colorado) University of California Hospitals, San Francisco, California—Surgery

Michael, Gina Lucette (St. Louis, Missouri) Duke University Medical Center, Durham, North Carolina—Internal Medicine

Morgello, Susan (Bronx, New York) The New York Hospital, New York, New York—Pathology

Murphy, Charles Edmond, Jr. (Atlanta, Georgia) Duke University Medical Center, Durham, North Carolina—Surgery

Nile, Peggy L. (Penfield, New York) Duke University Medical Center, Durham, North Carolina—Internal Medicine

Ormsby, Alice Marie (Portland, Oregon) University of Pennsylvania, Philadelphia, Pennsylvania—Internal Medicine

Ornstein, Steven M. (Wantagh, New York) Medical University of South Carolina, Charleston, South Carolina—Family Practice

Page, Susan (Raleigh, North Carolina) Bowman Gray, Winston-Salem, North Carolina—Family Practice

Patrick-Miller, Timothy J. (Racine, Wisconsin) University of Indiana, Indianapolis, Indiana—Pediatrics

Paull, Douglas E. (Dayton, Ohio) The New York Hospital, New York, New York—Surgery

Pin, Paul (College Park, Maryland) Barnes Hospital, St. Louis, Missouri—Surgery

Price, Julie Bridget (Woburn, Massachusetts) Duke University Medical Center, Durham, North Carolina—Orthopedics

Ralston, Matthew D. (Clarksdale, Mississippi) University of Alabama Medical Center, Birmingham, Alabama—Internal Medicine

Rowley, Katherine Montague (Virginia Beach, Virginia) Yale-New Haven Medical Center, New Haven, Connecticut—Pathology

Rowley, Richard Frederick (Albany, New York) Yale-New Haven Medical Center, New Haven, Connecticut—Internal Medicine

Russell, Byron Dale (Durham, North Carolina) University of Virginia, Charlottesville, Virginia—Surgery

Sasso, Robert Anthony (Harrison, New Jersey) University of Utah Affiliated Hospitals, Salt Lake City, Utah—Obstetrics and Gynecology

Saul, Jerome Philip (Atlanta, Georgia) Boston Children's Hospital, Boston, Massachusetts—Pediatrics

Schultz, Leslie Anne (Brielle, New Jersey) Case Western Reserve University, Cleveland, Ohio—Internal Medicine

Schwartz, Gregory G. (New York, New York) University of Colorado Affiliated Hospitals, Denver, Colorado—Internal Medicine

Schwartz, Michael A. (Charleston, West Virginia) Medical College of Virginia, Richmond, Virginia—Neurology

Shekelle, Paul (Oak Park, Illinois) University of California, Los Angeles, California—Internal Medicine

Shelton, Alan (Burlington, North Carolina) North Carolina Memorial Hospital, Chapel Hill, North Carolina—Internal Medicine

Siegel, Carol Deborah (Williamsburg, Virginia) University of Colorado, Denver, Colorado—Pediatrics

Spitz, Susan I. (Plainview, New York) Brown University, Pawtucket, Rhode Island—Family Medicine

Stringer, Arthur Vernon (Ellerbe, North Carolina) Duke University Medical Center, Durham, North Carolina—Obstetrics and Gynecology

Susskind, Mark Richard (Fairmont, West Virginia) Oregon Health Sciences University, Portland, Oregon—Surgery

Tarpey, Margaret M. (San Francisco, California) North Carolina Memorial Hospital, Chapel Hill, North Carolina—Anesthesiology

Vogel, Patrick M. (Durham, North Carolina) University of California, San Francisco, California—Internal Medicine

Walsh, Cathleen Stewart (Santa Monica, California) Pharmacologic Research, West Point, Pennsylvania

Warren, Jeffrey Steven (Salisbury, North Carolina) Columbia Presbyterian Medical Center, New York, New York—Surgery

Watson, William Bruce (Glen Ridge, New Jersey) Hospitals of the University Health Center of Pittsburgh, Pittsburgh, Pennsylvania—Emergency Medicine

Weir, Samuel G., III (Charlotte, North Carolina) North Carolina Memorial Hospital, Chapel Hill, North Carolina—Family Medicine

White, Richard D. (Burnt Hills, New York) University of California, San Francisco, California—Radiology

Wood, Catherine L. (Ames, Iowa) East Carolina University, Greenville, North Carolina—Pathology

Woodruff, William Walter, III (Lexington, North Carolina) Duke University Medical Center, Durham, North Carolina—Radiology

Wu, Katherine Gutmann (Janesville, Wisconsin) Duke University Medical Center, Durham, North Carolina—Psychiatry

Wu, Lawrence Reginald (Rochester, New York) Duke University Medical Center, Durham, North Carolina—Family Medicine

Yen, Tien-Sze Benedict (Palo Alto, California) University of California Hospitals, San Francisco, California—Pathology



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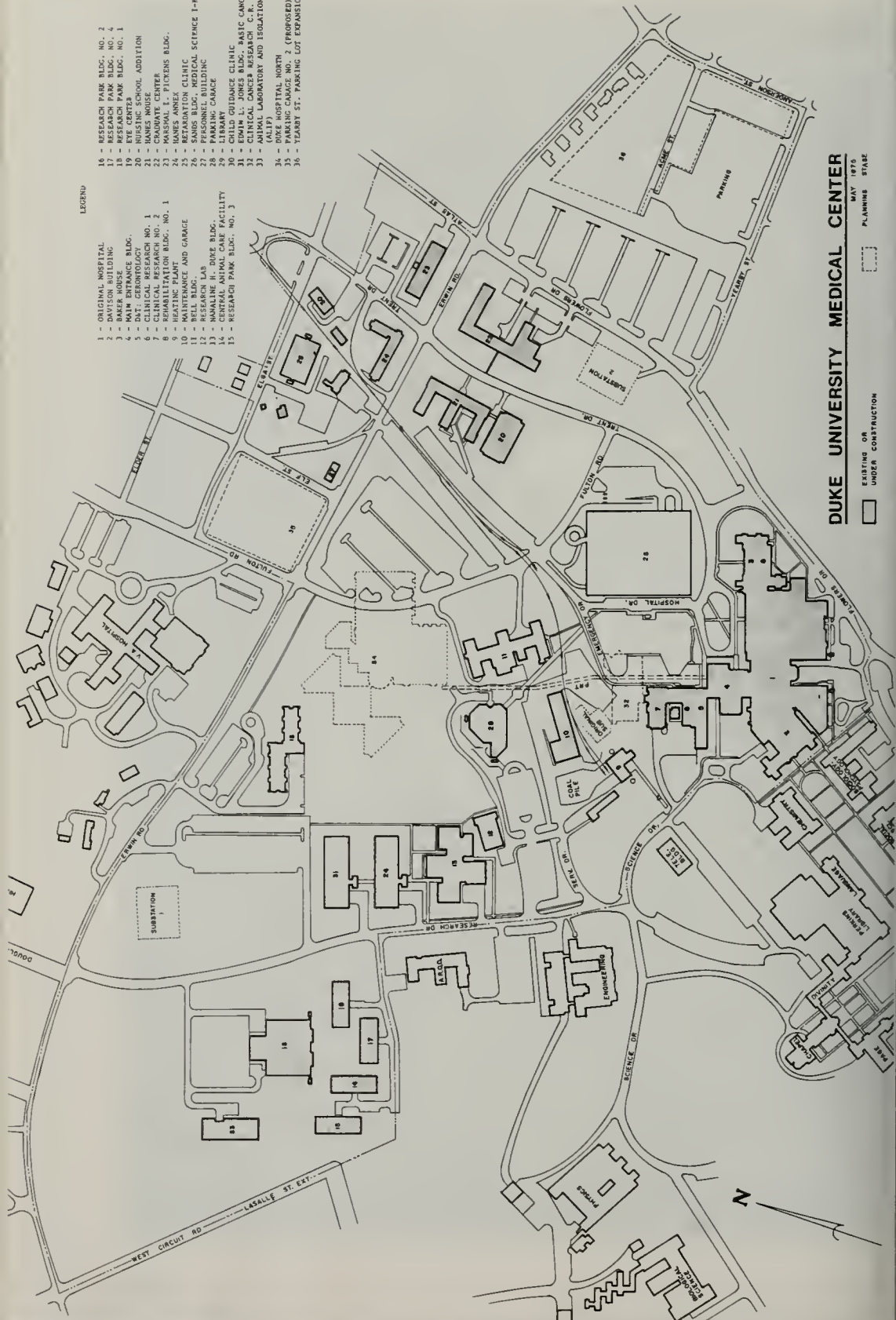
LEGEND

- 1 - ORIGINAL HOSPITAL
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- 4 - MAIN ENTRANCE BLDG.
- 5 - RADIOLOGY DEPARTMENT
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- 7 - CLINICAL RESEARCH NO. 2
- 8 - REHABILITATION BLDG. NO. 1
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- 10 - RESEARCH LAB
- 11 - BELL BLDG.
- 12 - RESEARCH LAB
- 13 - NURSING HALL
- 14 - CLINICAL RESEARCH NO. 3
- 15 - RESEARCH PARK BLDG. NO. 3
- 16 - RESEARCH PARK BLDG. NO. 2
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- 27 - PERSONNEL BUILDING
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- 29 - PARKING GARAGE
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- 31 - EDWIN L. JONES BLDG. BASIC CANCER RESEARCH
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- 35 - PARKING GARAGE NO. 2 (PROPOSED)
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- 17 - RESEARCH PARK BLDG. NO. 1
- 18 - RESEARCH PARK BLDG. NO. 1
- 19 - EYE CENTER
- 20 - NURSING SCHOOL ADDITION
- 21 - RADIOLOGY DEPARTMENT
- 22 - CHAMBER CENTER
- 23 - MARSHALL T. PICKENS BLDG.
- 24 - HANES ARMY
- 25 - HANES ARMY
- 26 - HANES ARMY
- 27 - PERSONNEL BUILDING
- 28 - PARKING GARAGE
- 29 - PARKING GARAGE
- 30 - CHILD GUIDANCE CLINIC
- 31 - EDWIN L. JONES BLDG. BASIC CANCER RESEARCH
- 32 - CLINICAL CANCER RESEARCH C.R. NO. 3
- 33 - CLINICAL CANCER RESEARCH C.R. NO. 3
- 34 - DIXIE HOSPITAL NORTH
- 35 - PARKING GARAGE NO. 2 (PROPOSED)
- 36 - TOWN ST. PARKING LOT EXPANSION

DUKE UNIVERSITY MEDICAL CENTER

- EXISTING OR
UNDER CONSTRUCTION
- PLANNING STAGE



bulletin of

Duke University 1983-84

The School of Law



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Duke University 1983-84

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EDITOR
Judy A. Beck
SENIOR EDITORIAL ASSISTANT
Elizabeth Matheson

PHOTOGRAPHS
Thad Sparks
David Paul
Karen Haywood
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The information in this bulletin applies to the academic year 1983-84 and is accurate and current, to the extent possible, as of June 1983. The University reserves the right to change programs of study, academic requirements, teaching staff, the calendar, and other matters described herein without prior notice, in accordance with established procedures.

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Calendar of the School of Law 1983-84

Fall Semester

1983

August	
19	Friday, Registration for entering and foreign students
20	Saturday, Orientation for entering students
22	Monday, Classes begin
October	
22	Saturday, Research and writing period for first-year students and placement recess for upperclass students begin
31	Monday, Classes for all students resume
November	
19	Saturday, Recess for reading and writing for first-year students
24	Thursday, Thanksgiving recess for all students begins
28	Monday, Classes resume
December	
2	Friday, Regularly scheduled classes end for upperclass students
5	Monday, Upperclass makeup for Thanksgiving vacation
6	Tuesday, Upperclass makeup for Thanksgiving vacation
7	Wednesday, Reading and examination period begins
9	Friday, Classes end for first-year students
23	Friday, Examination period ends

Spring Semester

1984

January	
3	Tuesday, Lawyers and Clients course for first-year students begins
7	Saturday, Examination in Lawyers and Clients
9	Monday, Classes for upperclass students begin; first-year, year-long courses resume and spring courses begin for first-year students
March	
3	Saturday, Spring recess for reading, writing, and placement travel begins
12	Monday, Classes resume
April	
18	Wednesday, Classes end
19	Thursday, Reading and examination period begins
May	
5	Saturday, Examination period ends
6	Sunday, Commencement

University Administration

Terry Sanford, J.D., LL.D., D.H., L.H.D., D.P.A., *President*
H. Keith H. Brodie, M.D., *Chancellor and Acting Provost*
Charles B. Huestis, *Vice-President for Business and Finance*
William G. Anlyan, M.D., D.Sc., *Vice-President for Health Affairs*
Eugene J. McDonald, LL.M., *Vice-President for Government Relations and University Counsel*
William J. Griffith, A.B., *Vice-President for Student Affairs*
John J. Piva, Jr., B.A., *Vice-President for Development and Alumni Affairs*
William L. Green, Jr., A.B., *Vice-President for University Relations*
Stephen Cannada Harward, A.B., C.P.A., *Treasurer and Assistant Secretary*
J. Peyton Fuller, A.B., *Associate Vice-President and Corporate Controller*
Roger L. Marshall, A.B., *Secretary of the University*
Andrew G. Wallace, M.D., *Associate Vice-President for Health Affairs*
Joel Fleishman, LL.M., *Vice-Chancellor*

Law School Administration

Paul D. Carrington, *Dean*
Thomas A. Croft, *Associate Dean for Administration*
Thomas D. Rowe, Jr., *Associate Dean for Research*
Charles R. Howell, *Assistant Dean for Director of Admissions*
Jean Taylor Adams, *Assistant Dean for Student Affairs*
Richard C. Maxwell, *Director of Continuing Legal Education*
Mary A. Monroe, *Administrative Assistant to the Dean*
Shirley Hanks, *Placement Officer*
Karen Haywood, *Senior Recorder*
Janse Conover, *Staff Assistant to the Dean*
Mary Jane Flowers, *Staff Assistant for Research and Publications*
Linda B. Harris, *Staff Assistant, Alumni and Development*
Mary Hawkins, *Financial Aid Assistant, Student Affairs*
Donna Moody, *Staff Assistant for Admissions*
Sarah F. Roberts, *Staff Assistant to the Director of the Library*
Evelyn Holt-Fuller, *Staff Assistant, Word Processing Center*





Altruism combined with realism; knowledge of fundamental principles and capacity to apply them; courage to insist on the right and patience to achieve it; understanding of the timidity of the weak; fearlessness of the domination of the powerful; sympathy for the mistakes of the indiscreet; caution of the craftiness of the unprincipled; enthusiasm for that which is fine and inspiring; reverence for that which is sacred; these are some of the attributes of great lawyers.

Justin Miller
Dean, 1930-34
Duke University School of Law

The Distinction of Duke



Mastering the Law

The business of the Law School is to provide a place where professors and students may join in the effort to explore and to master the discipline of law.

Many students come to law study with a limited perception of what they are about. Some suppose that law is a body of rules and that lawyers are people who know the rules. This is not wrong, but it is misleadingly incomplete. Legal rules are countless; many are subject to frequent change; they conflict; and their words often conceal more meaning than they reveal. Lawyers are people who understand and influence the ways in which elusive rules work in the minds of officials who must enforce them. Their discipline is thus more than a mass of data to be assimilated. It is an activity; and its mastery requires judgment and gift of expression as well as information.

Mastery of this discipline is rarely to be achieved by passive learning. True, much lonely effort is required. But full development requires substantial interaction with others. For most learners of law, the best school is the one that affords the best opportunity and inducement to participate in a prolonged conversation about the law with persons of wit, industry, and experience. The more intense the dialogue, the stronger is the mastery of the discipline.

One who seeks such interaction might wisely examine four qualities of a law school: the students, the faculty, the intellectual environment, and the program.

The Duke Law Students

Each year, about 175 first-year law students are enrolled at Duke; the aim is to maintain a student body of 500. Duke students are among the most rigorously selected in the United States; not more than four or five schools are able to maintain minimum academic admission standards that are higher than Duke's. Most entering students will present undergraduate academic records in the range of *A* minus or higher, and most will have scored around 700 on the standardized test or higher.

Equally important, most Duke students bring other qualifications that assure their ability to contribute to the enterprise of mutual learning. About twenty-five members of a recent typical class are over twenty-five years of age. Many of these persons have recorded significant achievements in some activity outside the law. Others have attained graduate degrees in other disciplines. More have achieved particular distinction as undergraduates. Thus, there are accomplished writers, experienced performing artists, outstanding athletes, and others of unusual achievement.

Duke law students are unusually diverse in their backgrounds. The geographic distribution may be the broadest of any American law school. The number of under-

graduate institutions represented in the student body is almost certainly the largest in proportion to size. As must be the case with such institutions, the great bulk of the students are from middle-class suburban families. But a few are from rural communities. Some are from inner-city neighborhoods. And the ethnic diversity is substantial. There is not and has never been a quota of any kind at Duke, but there is a continuing effort to achieve racial diversity in the mix of the student body.

Diversity has been achieved with no substantial compromise on academic or intellectual qualifications. No one has been admitted to Duke who was regarded as a serious academic risk. The quality of Duke's minority students is attested to by the fact that in one recent class, four of twelve members achieved election on merit to the honorific Duke *Law Journal*.

The Duke Law Faculty

There are presently thirty-one persons holding professorial appointments in law at Duke; all but nine of these hold academic tenure. They were selected after extensive search for the persons with the greatest capacity for legal discourse. Those holding tenure are persons who have proven themselves as excellent scholars who maintain positions of prominence in their fields. They are also expected to maintain excellence in the classroom. The full-time faculty are not expected to practice law; while minor consulting efforts are an appropriate method for maintaining contact with the profession, the professors are committed to scholarship, teaching, and public service. Most of the faculty have had substantial experience as lawyers, and not infrequently leaves are granted for the purpose of performing professional work elsewhere. Each year, several of the faculty are absent to teach elsewhere, to engage in research or government, or to assist in the administration of the University. But their places are filled with visiting faculty, and the visitors are often persons of unusual stature.

The professorial faculty is assisted in the presentation of the law curriculum by a number of persons who have limited or qualified commitments to the law school program. The faculty includes senior lecturers, lecturers, fellows, and instructors in legal research. These persons are selected on the basis of the special contribution that each is able to make to the teaching program. They are selected from year to year in light of the needs of Duke students for particular kinds of instruction. A number of the adjunct faculty are legal practitioners; a few are scholars in law-related disciplines.

The Duke Environment

The Law School is part of a university of relatively recent origin. Founded in 1924 with a single giant benefaction to a small college, Duke promptly took a place beside Stanford and Chicago among the newer elite of American universities. Most of its schools and departments are recognized as superior. The School of Medicine and its hospital are particularly noted. All of the University's endeavors are conducted on a moderate scale with respect to the numbers of students served. Less than ten thousand students are enrolled in the University.

The relatively small size of the Law School is an important attribute. There is very little anonymity at Duke. Students are close to the faculty and to one another. The resulting sense of community tends to ease competitive pressure. Law students everywhere are an aggressive lot, and some elite law schools can be infected with a spirit of destructive competition. This can seriously obstruct the process of mutual instruction, and can even cause passivity and alienation among many students. Inertia in the midst of frenzy is the unfortunate syndrome. The phenomenon occurs less frequently in an institution that is conducted on a smaller, human scale, where friendships are more easily maintained. At such a school, it is more likely that competition amongst students will be stimulating and benign.

The sense of community within the Law School at Duke is enlarged by the fact that few of the students are involved with competing interests or relations in the area. Only one in nine of the students is a North Carolinian. Less than one in ten has previously attended Duke University. Relatively few are employed outside the University during the academic year. Most live, during the academic year, within a few minutes of the school. Thus, although the Law School does not maintain a residential facility for law students, there is at all times a substantial group of students working and talking in the building. The law building is not dramatic, but is designed to accommodate a fairly intimate and sociable learning habit.

The city in which Duke is located is a nineteenth-century tobacco mill town, the home of Bull Durham, Chesterfields, and Lucky Strikes. It is also now the location of a particularly prosperous black business community that includes the headquarters of a large insurance company. And it is part of a metropolitan area that includes Raleigh, the state capital, and Chapel Hill, the location of the University of North Carolina's main campus.

This metropolitan area does provide ample opportunity for recreation, but the attractions are not so numerous as to be a major source of distraction. It is no longer remote; there are frequent short flights to Washington. And its cultural isolation, a remnant of southern history, is rapidly diminishing. The center of the metropolitan area is now the Research Triangle Park, where over thirty substantial research laboratories are located, and where over twelve thousand scientists and engineers are employed. The high concentration of professional and scientific workers in the area has brought significant change. A symphony orchestra of quality is supported. In 1978, the American Dance Festival relocated in Durham. In 1982, the University opened a new student center which provides excellent accommodations for orchestral, ballet, and theatrical performances, and for films. This center is a few hundred yards from the Law School.



The Duke Program

The curriculum is distinctive in the degree to which students are drawn into formal dialogue with the faculty and with one another.

The most distinctive features are presented in the first year. Duke, unlike most schools serving similar students, invests a proportionate share of its teaching resources to instruction of first-year students. Students are generally assigned to take one beginning course in a class of not more than twenty-five students; in these classes, a heavy emphasis is placed on student participation. Every member of the class is expected to participate in the discussion frequently.

In addition, all first-year students are assigned to a tutorial program in legal writing and advocacy. Each member of the class is required to do a substantial amount of writing under faculty supervision. Student work is criticized and often rewritten until a high standard of quality is achieved. The experience provided is not unlike that which is afforded at many schools only to those students who are elected to law reviews, where the students vigorously edit the work of one another.

The intended effect of these features of the first-year program is to involve students more deeply with one another and with the faculty in a shared intellectual enterprise. This effort is continued through the upperclass years in the seminar offerings.

Beginning in 1983, one-eighth of the entering law class will be admitted for a special program beginning about the first of June. These students will begin the study of law simultaneously with the study of economics or philosophy at the graduate level; this bifurcated study will continue through the first year; at the end of that year, these students will have completed all of the work required of first-year law students, and will also have made a solid start on an advanced degree in a second discipline. The purpose of this program is to reinforce the interest of the participating students in law as an academic discipline that is linked to others. This program will be experimental in its first two years of operation. It is a joint venture of the Law School and the Graduate School.

A number of the advanced seminars are presented by the clinical method. Students are placed in professional roles and asked to perform the intellectual endeavors of lawyers. Their performances are criticized, often by practitioners who are actively engaged in the professional activity involved. Many of these clinical seminars require substantial writing. One, the seminar on trial practice, is largely forensic and involves heavy use of videotape to review and criticize student presentations.

Other seminars are directed at more purely theoretical topics. But these, too, are conducted in small groups of twenty-five or less, and generally require substantial writing. These offerings also serve to bring students into closer contact with one another and with the faculty in the common pursuit.

A new feature of the upperclass curriculum is the Research Tutorial, which brings together a small group of students and faculty for the purpose of a joint venture in scholarship leading to publication.

The substance of law study at Duke is otherwise largely the same as that presented elsewhere; all American law schools study the same general subject. First-year offerings are especially conventional. The Duke law curriculum, like that of other fine schools, does offer a few features that reflect interests, traditions, or opportunities that are special if not unique. At Duke, a special effort is made to provide substantial advanced offerings in the corporate area and in particular areas of litigation.

The Duke program is not ideal for all applicants. Despite the distinctive features of the curriculum, the prospective applicant should note that larger schools with larger faculties may present a somewhat larger array of offerings. This is the one unavoidable adverse consequence of maintaining a smaller size. Students who are especially keen to have the widest possible selection of advanced courses would be

wise to examine the catalogues of the largest schools. Whether the trade seems advantageous or not must necessarily depend in part on how highly the individual values the characteristics that Duke seeks to preserve by its smaller size. Especially for those who prefer anonymity, or who value the right to remain passive in the assimilation of learning provided by others, Duke is not likely to be the best choice. Nor is it likely to be best for those who wish to test themselves in an atmosphere of unrestrained academic competition.

The Status of Duke

In addition to these four characteristics of a law school, many applicants are strongly influenced by a more general sense of institutional status or repute. Indeed, the desire to achieve status is a very powerful force, and is often closely related to professional goals; hence it is not surprising that law school applicants are susceptible to such appeal.

One might be tempted to dismiss their preoccupation as unworthy. Those who make choices on the basis of a social or an academic pecking order may seem to care more about the appearance than the reality of what they do. Certainly, we should all take care not to mistake any academic credential, however lustrous, for wisdom or virtue. It is probably true that we pay more respect to such paste jewelry than it deserves.

Yet, the consequences of institutional status are real. Status can be converted into money, power, and influence through the operation of the job market. In a sense, persons selecting a professional school do become members of a guild who share in some degree a common repute and a common access to employment opportunities. The value of being certified by an elite law school can even be crudely measured by econometricians. Crude as they may be, these measurements do reflect real perceptions by an identifiable public.

According to social scientists who measure institutional status of law schools, it appears that Duke is presently assigned a rank not higher than ninth nor lower than thirteenth. Inasmuch as these are the only scientific data available on the subject of law school quality, the consumer might well be tempted to rely wholly on such rankings. One could do worse.

On the other hand, one who is bent on this approach might also wish to consider another factor that bears on the worth of one's academic credential and that may be considerably more consequential than the status of the institution. This is the academic record attained by the individual in question. Although academic records are very narrow measures of capacity and poor forecasts of the productivity of careers that lie ahead, they are taken seriously for a time by people who have no better basis for judgment. Thus, a distinguished graduate of an undistinguished school may have better first opportunities than would be open to the same person with an undistinguished record at a distinguished school. This is annually an occasion for sorrow by graduates of elite schools who are passed over in the initial job market for persons who failed to gain admission to equally prestigious schools. So the clear-eyed person exclusively concerned with "maximizing options" must balance institutional status against a prediction of his or her own academic attainment.

When the risk factor is taken into account, it seems imprudent to rely wholly on perceptions of institutional status as a basis for choice. Status is a legitimate and relevant datum. But, as GNP does not reveal the quality of national life, so institutional status does not reveal the effective utility of a particular school for an individual student. Duke would prefer to attract its students on the basis of its personnel, its program, and even its location, leaving the matter of status to take care of itself. No assurance can be made to any student that he or she will achieve higher status by reason of attendance at Duke.

Nevertheless, a few words may be addressed to the concern. In addition to the statistical measures of institutional fame, those less familiar with the institution are entitled to know that the alumni, though few in number, are widely distributed in important professional positions throughout the country. They hold important positions in the government and in the judiciary. Many are partners in major law firms, including firms in almost every large American city. A significant number are teaching law in other universities. The quality of the alumni group is attributable in part to the fact that Duke admission standards have always been high. Thus, placement of Duke graduates has never been a major institutional problem. This is not to say, of course, that most Duke students get precisely the jobs they want. No law school could make such an assertion. There is always some adjustment to be made by many students to match aspiration to opportunity. It should also be acknowledged that there may be a few communities in the United States that are sufficiently insular that penetration by outsiders is difficult; New Orleans is one preeminent example. But even in such communities, small numbers of Duke law alumni can be found working and prospering. And, in contrast, there are some southern cities in which Duke law alumni play a truly dominant role.

Law at Duke and Professional Competence

Another matter that may weigh in the minds of many prospective law students is the objective of achieving professional competence. Interest in this goal has been heightened in recent years by the number of expressions of doubt about the competence of lawyers that have come from persons highly placed in the profession. Some have suggested that law schools are doing less than they should to assure the competence of their graduates.

Because of the timeliness of the subject, it seems wise to point out that the professional competence of its graduates is not an assurance that any program of university instruction in law should make. Most Duke alumni are very competent, indeed, to perform their work. But there are several reasons why Duke cannot accept responsibility for the quality of the services ultimately delivered by its graduates. And it may be useful for prospective students to have in mind some of them.

One reason is that law students will as lawyers perform an enormous diversity of services. Merely defining general legal competence is a task beyond our present capacity; only if the work is more narrowly defined does the objective have meaning. Most students do not have sharply defined career objectives.

A second reason for diffidence is that the ingredients of competence, insofar as we understand them, include diverse personal traits that a university has but limited capacity to influence and no ability to control after graduation. Competence is, for the most part, a condition or a habit that lawyers must impose upon themselves.

Thirdly, it is true that much lawyer work is not of the sort that makes rigorous intellectual demands. The University seeks to maintain an environment in which questioning and speculation are the normal disposition. Such an institution is inefficient and ineffective when its energies are applied to the more confining tasks of technocracy that may be a part of many lawyers' work.

This is not to say that academic law training at Duke is unrelated to professional competence. The skills of reading, writing, speaking, listening, and thinking are elevated by academic work in law, and they are the basic skills of lawyers. Thus, most of the Duke program of individual instruction is especially helpful in achieving professional competence.

Moreover, there is very little work of importance that is performed by lawyers that does not depend in part on an understanding of the law, which is the central object of academic study. While mastery of law as an intellectual discipline is not a guarantee of competence, it is certainly a major component. Indeed, it is true for the

most challenging work performed by lawyers that highly theoretical study is the best preparation. Many professional tasks call for imagination, judgment, and wisdom; these are traits that are associated with the pursuit of law as an intellectual discipline. Development of such traits is, to be sure, an enterprise to be extended over the whole of a career and is not the end of university law training. The office of academic law study is to open minds to the range of possibilities that may be pursued by those who aspire to still deeper understanding and stronger mastery of the subject.

It may be that the most important effects of a Duke law education on lawyer competence are not immediately aimed at job performance. Thus, among the tasks that the faculty sets for itself is to enable students to perceive law as a humanist discipline, demanding in its intricacy, but incorporating at times the whole range of human experience. What students bring to law study in understanding history, philosophy, literature, anthropology, and a dozen other disciplines is truly relevant and ought not to be left at the portals of courtrooms and law offices. The lawyer who retains a generous sense of relevance is more likely to grow in wisdom and judgment over the longer term of his or her career.

Moreover, competence seems to be closely associated with the pride and self-esteem of individual professionals. It is no small source of pride if law students can know that they have met some of the most intractable problems that men and women can meet, and have yet performed with credit.

Finally, competence seems also to be associated with professional integrity because it depends on a willingness to perform even when rewards are postponed, or unpromised. One feature of law that is fully revealed only to those who have pursued it rigorously is that even at its worst, when the law is stupid or cruel, it retains a tendency to improve itself. If thus seen to reflect a heartening idealism, it provides a comfort to the lonely practitioner in those moments when he or she is tempted to forsake craftsmanship, to overreach or neglect a client.

In these ways, the kind of experience that Duke seeks to provide is preparation more for a career than for a job.

Conclusion

Duke does not expect law students to come with well-defined career goals. It does expect that they will bring a respect for the academic enterprise and a curiosity about the institutions and values of law. It also expects that those who leave will share a commitment to the craft of law, and a spirit that will help them bear important responsibilities through all of their productive years, with credit to themselves and to one another. The contribution that Duke hopes to make is to provide an environment in which such shared commitments can germinate and flourish.

Law Faculty



Jean Taylor Adams, B.A., M.Ed., J.D., Senior Lecturer in Law

B.A. 1972, M.Ed. 1975, J.D. 1979, Duke University. Ms. Adams spent her early years in the area of Philadelphia, Pennsylvania. She was employed by Duke University for two years as an Admissions Counselor and for two years in the Development Office in the estate planning division. She compiled an unusually distinguished academic record in law school, where she also served as Editor-in-Chief of the *Duke Law Journal*. She began her professional career in law in 1980, teaching in the area of estate planning and taxation. In 1983 she assumed the position of Assistant Dean for Student Affairs.



Marilyn Yarbrough Ainsworth, B.A., J.D., Visiting Professor of Law

B.A. 1966, Virginia State College; J.D. 1973, University of California at Los Angeles. Professor Ainsworth was Editor-in-Chief and, later, Executive Director of *Black Law Journal*. She taught at the University of California at Los Angeles and Boston College before joining the University of Kansas faculty in 1976, where she became Professor of Law in 1981. Her interests include the fields of civil rights and patents, trademarks, and copyright. At Duke, Professor Ainsworth will be teaching in the areas of torts and race discrimination law.



Richard F. Babcock, A.B., J.D., M.B.A., *Visiting Professor of Law*

A.B. 1940, Dartmouth College; J.D. 1946, M.B.A. 1950, University of Chicago. Mr. Babcock has practiced planning law in Chicago for thirty years. He has also served as President of the American Planning Association from 1971-72; and Chairman of the Advisory Committee of the American Law Institute Project on a Model Land Development Code from 1965-75. He has written four books, including *The Zoning Game*, and has lectured widely on land-use planning and related topics. Mr. Babcock will be teaching a course in land-use planning in the spring.



Katharine Tiffany Bartlett, B.A., M.A., J.D., *Associate Clinical Professor of Law*

B.A. 1968, Wheaton College; M.A. 1969, Harvard University; J.D. 1975, University of California, Berkeley. A native of Connecticut, Professor Bartlett served for three years as a secondary school teacher in that state before entering law school. She commenced her legal career with a judicial clerkship in the Supreme Court of California. From 1976 to 1979, she worked as a Staff Attorney at the Legal Aid Society of Alameda County concentrating on law reform and major impact litigation. Since 1979, she has been teaching in the clinical studies program at Duke. Her special areas of interest include the child and the law, and public school law.



Sara Sun Beale, B.A., J.D., *Associate Professor of Law*

B.A. 1971, J.D. 1974, University of Michigan. A native of Toledo, Ohio, Professor Beale's experience includes a judicial clerkship on the United States Court of Appeals, as well as a year in private practice in Detroit, Michigan. In 1976 she joined the United States Department of Justice, where she served one year in the Office of Legal Counsel, and two years in the Office of the Solicitor General. She began her teaching career at Duke in 1979. Her principal academic interests are in the field of criminal law and procedure.



Charles L. Becton, B.A., J.D., *Senior Lecturer in Law*

B.A. 1966, Howard University; J.D. 1969, Duke University. A native of Morehead City, North Carolina, Mr. Becton began his legal career with a year of service as an attorney for the NAACP Legal Defense and Educational Fund, after which he entered private practice in Charlotte and in Chapel Hill, North Carolina. He is a litigation specialist who has lectured widely on trial practice, including for the National Institute of Trial Advocacy, the North Carolina Academy of Trial Lawyers, and at Harvard Law School and the University of North Carolina School of Law. He has been teaching a course on the subject at Duke since 1980. He is currently a North Carolina Court of Appeals Judge.



Herbert Bernstein, Dr. jur., J.D., *Martha G. Price Visiting Professor of Law*

Dr. jur. 1962, Universität Hamburg; J.D. 1967, University of Michigan. After completing the requirements of legal training in Germany, Professor Bernstein took a second degree in law at the University of Michigan. From 1967 to 1971 he taught at the University of California at Berkeley, then returned to Hamburg as Professor of Law at the University. In addition to his professorial appointment, Dr. Bernstein is currently Codirector of the Institute of Foreign Law and of Private and Procedural International Law (University of Hamburg), Managing Director of the Institute for Insurance Matters (University of Hamburg), and a corresponding academic member of the Max-Planck-Institute of Foreign and Private International Law. He is the author of numerous books and articles on diverse subjects in the fields of international law, conflict of laws, insurance, and business law. He will be teaching in the areas of comparative law and insurance.



Donald H. Beskind, A.B., J.D., LL.M., *Senior Lecturer in Law*

A.B. 1969, George Washington University; J.D. 1973, University of Connecticut; LL.M. 1977, Duke University. Mr. Beskind is from Westport, Connecticut. He engaged in private practice in Denver for two years before coming to Duke in 1975. As an Assistant and Associate Professor, he taught evidence and courses in the Clinical Studies Program. From 1979-80 he was Director of that program. Since 1976, he has prepared instructional materials and led programs for the National Institute for Trial Advocacy. Mr. Beskind is a partner in a Durham law firm and teaches occasional courses as a Senior Lecturer.



H. Keith H. Brodie, A.B., M.D., *James B. Duke Professor of Psychiatry and Law and Chancellor, Duke University*

A.B. 1961, Princeton University; M.D. 1965, Columbia University. Dr. Brodie served at hospitals in New Orleans and New York City before becoming a Clinical Associate with the National Institute of Mental Health in 1968. In 1970, he joined the medical faculty of Stanford University. He was awarded a first prize in 1971 for research by the American Psychological Association. Dr. Brodie is a member of the Institute of Medicine of the National Academy of Sciences and he has chaired IOM's Board of Mental Health and Behavioral Medicine. He came to Duke in 1974 as Professor and Chairman of the Department of Psychiatry and Director of Psychiatric Services at Duke University Medical Center. He has also served as President of the American Psychiatric Association. His most recent book is *Modern Clinical Psychiatry*, published in 1982. He teaches in the area of psychiatry and law.



Paul D. Carrington, B.A., LL.B., *Professor of Law*

B.A. 1952, University of Texas; LL.B. 1955, Harvard University. Professor Carrington is a native of Dallas, Texas. His professional experience includes a brief stint in private practice in Dallas and in a military law office, as well as occasional work for the American Civil Liberties Union and the American Association of University Professors. Since his teaching career began in 1957, he has taught at more than a dozen law schools, including most notably the University of Michigan, where he served from 1965 to 1978, before becoming Dean at Duke. He has been active in judicial law reform efforts, particularly in regard to appellate courts and procedure. He has also been involved in the affairs of the Association of American Law Schools, most recently as Chairman of its Accreditation Committee. His public activities also include a term on the Ann Arbor Board of Education. He has published in the fields of civil procedure, education law, and legal education.



Michael G. Chiorazzi, B.A., J.D., M.L.L., *Instructor in Legal Research*

B.A. 1976, University of Miami; J.D. 1980, Gonzaga University; M.L.L. 1981, University of Washington. Mr. Chiorazzi is a native of New Jersey. After graduating from Gonzaga Law School, he studied law librarianship at the University of Washington in Seattle. He joined the Duke Law Library staff in September of 1981, serving as a Reference Librarian and an Instructor in Legal Research.



George C. Christie, A.B., J.D., S.J.D., James B. Duke Professor of Law

A.B. 1955, J.D. 1957, Columbia University; S.J.D. 1966, Harvard University. A native of New York City, Professor Christie was Editor-in-Chief of the *Columbia Law Review*. He commenced his legal career with private practice in Washington, D.C. In 1960-61, he was a Ford Fellow at Harvard Law School; and in 1961-62, he was a Fulbright Scholar at Cambridge University, where he earned a Diploma in International Law. He then joined the law faculty of the University of Minnesota, where he taught for almost four years. In 1966, he returned to Washington to serve as Assistant General Counsel for the Near East and South Asia of the Agency for International Development before coming in 1967 to Duke. His chief academic interests are in the areas of torts and jurisprudence, in both of which he has published widely. He is the editor of a casebook in jurisprudence published in 1973 and one on torts published in 1983. His monograph, *Law, Norms and Authority*, was published in 1982. He was on leave during the academic year 1980-81, serving as a fellow of the National Humanities Center. He has been a visiting professor at the Universities of Michigan, Florida, and Witwatersrand.



Kathryn M. Christie, B.A., M.A., J.D., M.S.L.S., Instructor in Legal Research

B.A. 1971, Duke University; M.A. 1972, J.D. 1979, M.S.L.S. 1980, University of Illinois at Champaign-Urbana. A Florida native, Ms. Christie began her professional career as research attorney and county law librarian for the Sixth Judicial Circuit in Urbana, Illinois. She joined the Duke law library staff in July, 1982 as Reference and Research Librarian. She teaches legal research.



William Brent Kelly Cotter, B.C., LL.B., LL.M., Scholar in Residence

B.C. 1971, University of Saskatchewan; LL.B. 1974, LL.M. 1979, Dalhousie University. Professor Cotter is a native of Moose Jaw and has practiced law in Saskatoon. He has been a member of the Dalhousie faculty since 1977. He is a coauthor of *Employment Law in Canada*, published in 1980. His professional interests include the law of professional responsibility and comparative constitutional law. He is also President of the Metro Major Curling League of Nova Scotia.



James D. Cox, B.S., J.D., LL.M., *Professor of Law*

B.S. 1966, Arizona State University; J.D. 1969, University of California, Hastings College of the Law; LL.M. 1971, Harvard University. Professor Cox is a native of Ellinwood, Kansas. He entered law teaching as a teaching fellow at Boston University, following which he taught at the University of San Francisco, Stanford University, and the University of California, Hastings College of the Law, before coming to Duke in 1979. He has focused his writing and teaching in the areas of corporate and securities law. Professor Cox is the author of a 1980 book on the utilization of financial information in the regulation of public corporations.



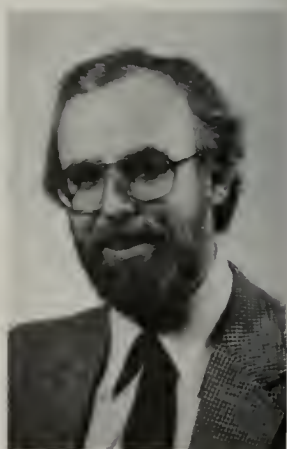
Thomas A. Croft, A.B., J.D., *Senior Lecturer in Law*

A.B. 1976, J.D. 1979, Duke University. Following graduation from law school, Mr. Croft returned to his native city of St. Louis, Missouri, where he engaged in private practice, concentrating in the area of commercial litigation. He has been at Duke since 1980 and serves as Associate Dean for Administration. His primary teaching interest lies in the area of financial information, in which he draws on his expertise and prior teaching experience in accounting.



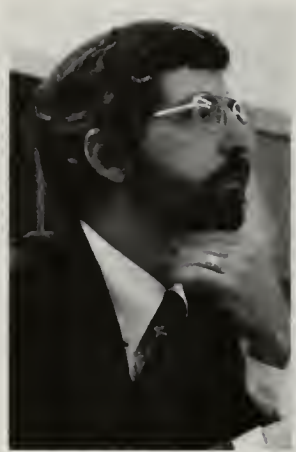
Richard A. Danner, B.A., M.S., J.D., *Associate Professor of Legal Research*

B.A. 1969, M.S. 1975, J.D. 1979, University of Wisconsin. Professor Danner comes from Madison, Wisconsin. Prior to joining the library staff at Duke as Associate Law Librarian in 1979, he was Environmental Law Librarian at the University of Wisconsin. He assumed directorship of the Law Library in 1981. He continues to teach legal research. His book, *Legal Research in Wisconsin*, was published in 1980.



Walter E. Dellinger III, A.B., LL.B., Professor of Law

A.B. 1963, University of North Carolina; LL.B. 1966, Yale University. Professor Dellinger is a native of Charlotte, North Carolina. He taught political and civil rights at the University of Mississippi from 1966 to 1968. In 1968-69, he served as a judicial clerk in the Supreme Court of the United States. He joined the Duke law faculty in 1969, serving as Associate Dean from 1974 to 1976 and as Acting Dean from 1976 to 1978. He has also taught at the University of Southern California and the University of Michigan. He has, since 1969, served as Consultant and Draftsman to the North Carolina Criminal Code Commission. He was on leave for the academic year 1980-81, with the United States Department of Justice, in Washington, D.C.



Deborah A. DeMott, B.A., J.D., Professor of Law

B.A. 1970, Swarthmore College; J.D. 1973, New York University. Professor DeMott spent her early years in DuBois, Pennsylvania. She served as Articles Editor of the *New York University Law Review*. She began her professional career with a judicial clerkship in a federal court in New York City, and later practiced with a large law firm in that city, until she joined the Duke law faculty in 1975. She has also taught at the University of Texas. She is the editor of a 1980 book on corporate governance. Her other writing is on the fields of corporate law and securities regulation. She will be on leave for the spring semester of 1984.



Harry T. Edwards, B.A., J.D., Distinguished Lecturer in Law

B.A. 1962, Cornell University; J.D. 1965, University of Michigan. After graduating from law school, Judge Edwards practiced law in Chicago for five years, specializing in the representation of management in labor disputes. In 1970, he returned to the University of Michigan as a Professor of Law, remaining there until 1980, except for the two years, 1975-77, when he was a tenured member of the faculty of Harvard University Law School. From 1979-80, he also served as Chairman of the Board of Directors of AMTRAK. In addition to his teaching at Michigan and Harvard, he has also taught at the University of Pennsylvania and the Free University of Brussels. In 1980, he was appointed by President Carter to the United States Court of Appeals for the District of Columbia Circuit, a position he continues to hold. Judge Edwards is the author of several books on labor relations, arbitration, and higher education law. At Duke, he teaches a Clinical Seminar in Federal Courts and the Appellate Process.



Robinson O. Everett, A.B., J.D., LL.M., *Professor of Law*

A.B. 1947, J.D. 1950, Harvard University, LL.M. 1959, Duke University. Professor Everett is a native of Durham, North Carolina. He served for several years as a Legal Officer in the Air Force and as a Commissioner of the United States Court of Military Appeals. He returned to Durham to enter a general practice, which he continued until 1980 when he ascended to the bench of the United States Court of Military Appeals as Chief Judge. From 1961 to 1964, he served as Counsel to the Subcommittee on Constitutional Rights of the United States Senate Judiciary Committee. He has been active in the affairs of the North Carolina Bar and of the community of Durham. He has long served as a Commissioner on Uniform State Laws and has been active in various law reform efforts. He has published on many legal topics, most notably military justice and local government law. His teaching at Duke began as early as 1950. He was elected to regular membership in the faculty in 1967.



Peter G. Fish, A.B., A.M., Ph.D., *Professor of Political Science and Law*

Peter G. Fish received his A.B. from Princeton University and his A.M. and Ph.D. from the Johns Hopkins University where he studied under the late Carl Brent Swisher. He was a Guest Scholar at the Brookings Institution before teaching courses on American constitutional law and development as well as on the judicial process at Oberlin College, Princeton University, and, since 1969, in the Department of Political Science at Duke. Professor Fish is author of *The Politics of Federal Judicial Administration* (1973) and of numerous articles. His present research relates to the political-judicial career of John J. Parker, Judge of the United States Court of Appeals for the Fourth Circuit, 1925-58. From 1977-79 Professor Fish served as a lay member of the United States Circuit Judge Nomination Commission, Panel for the Fourth Circuit.



Joel L. Fleishman, A.B., J.D., M.A., LL.M., *Professor of Law and Public Policy Sciences*

A.B. 1955, J.D. 1959, M.A. (Drama) 1959, University of North Carolina; LL.M. 1960, Yale University. Professor Fleishman is a native of Fayetteville, North Carolina. He began his career in 1960 as Assistant to the Director of the Walter E. Meyer Research Institute of Law at Yale. From 1961 to 1965, he served as Legal Assistant to the Governor of North Carolina. He then returned to Yale, first as Director of the Yale Summer High School, and then as Associate Provost for Urban Studies and Programs. In 1969, he became Associate Chairman of the Center for the Study of the City and Its Environment and Associate Director of the Institute of Social Science at Yale. In 1971, he came to Duke as a member of the law faculty and as Director of the Institute of Policy Sciences and Public Affairs. He is also Vice-Chancellor of the University, and, since 1982, Chairman of the Capital Campaign for the Arts and Sciences. His principal writings deal with legal regulation and financing of political activities; his current work is on political ethics, postal policy, and telecommunications policy generally. He will remain on leave of absence for the academic year 1983-84.



C. Allen Foster, B.A., B.A. (Juris.), M.A. (Juris.), J.D., *Lecturer in Law*

B.A. 1963, Princeton University; B.A. (Juris.) 1965, M.A. (Juris.) 1971 Oxford University; J.D. 1967, Harvard University. Mr. Foster has considerable experience in the areas of construction law, labor law and arbitration, employment discrimination, and litigation. After graduating from Princeton, where he took his degree in history *summa cum laude*, he accepted a Fulbright scholarship to attend Brasenose College, Oxford University, which awarded him his first degree in law (with first-class honors) in 1965. After completing the requirements for the J.D. at Harvard Law School, he began private practice in Greensboro, North Carolina. He has since served as counsel and consultant in a variety of industrial and arbitration contexts. He is the U.S. representative to the International Energy Agency Dispute Resolution Center in Paris and is a partner in a Greensboro law firm.



Pamela Gann, B.A., J.D., *Professor of Law*

B.A. 1970, University of North Carolina; J.D. 1973, Duke University. A native of Monroe, North Carolina, Professor Gann was Articles Editor of the *Duke Law Journal*. She practiced with private firms in Atlanta and Charlotte before returning to Duke to teach in 1975. She has also taught at Washington University and the Universities of Michigan, Virginia, Colorado, and San Diego. She is the coeditor of a 1983 casebook on corporate taxation. During 1984 she will be on leave as an International Affairs Fellow of the Council on Foreign Relations.



Claire M. Germain, B.A., LL.B., M.C.L., M.L.L., *Lecturer in Comparative Law*

B.A. 1971, LL.B. 1974, University of Paris; M.C.L. 1975, Louisiana State University; M.L.L. 1977, University of Denver. A native of France, Ms. Germain has served as a research associate in French and German law at Louisiana State University, a research assistant at the Organization for Economic Cooperation and Development in Paris, and as a guest librarian and research fellow at the Max Planck Institute for Foreign and Private International Law in Hamburg, West Germany. At Duke since 1977, she has served as senior reference librarian, as academic adviser to foreign students, and as instructor in legal research.

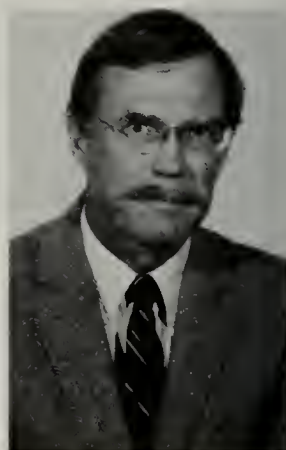


Martin P. Golding, B.A., M.A., Ph.D., *Professor of Philosophy and Law*
 B.A. 1949, M.A. 1952, University of California, Los Angeles; Ph.D. 1959, Columbia University. A native of New York City, Professor Golding taught at Columbia University from 1957 to 1970 and at the City University of New York from 1970 to 1976 before coming to Duke in 1976 as Professor and Chairman of the Department of Philosophy. He has also taught at New York University, Bar-Ilan University in Israel, and the Universities of California (both Berkeley and Los Angeles), Southern California, and Colorado. His writing includes two books, *The Nature of Law* (1966) and *Philosophy of Law* (1975), and numerous articles on jurisprudence and ethics.



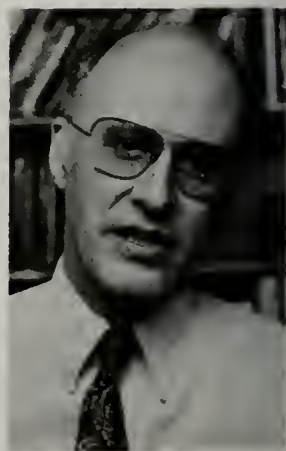
Michael W. Gordon, B.S., J.D., M.A., Dipl. de Droit Compare, *Visiting Professor of Law*

B.S. 1957, J.D. 1963, University of Connecticut; M.A. 1968, Trinity College; Diplome de Droit Compare 1973, University de Strasbourg. After private practice in Hartford, Professor Gordon joined the law faculty at the University of Connecticut in 1966. He accepted an appointment at the University of Florida in 1968, where he has been Professor of Law since 1971. Professor Gordon has also taught in Mexico and Guatemala. His teaching and research interests center on corporation law, with special reference to comparative and international aspects of business. He will be teaching Corporate Finance, International Business Transactions, and Comparative Law: Western and Socialist Traditions.



Clark C. Havighurst, A.B., J.D., *Professor of Law*

A.B. 1955, Princeton University; J.D. 1958, Northwestern University. Professor Havighurst is a native of Evanston, Illinois. He spent two years in military service, one year as a Research Associate at Duke, and three years in private law practice in New York City before beginning his teaching career at Duke in 1964. Professor Havighurst was for five years the editor of *Law and Contemporary Problems*. In addition to teaching antitrust law and the law of regulated industries, he has a special academic interest in the regulation of the health care industry and in national health policy. His book, *Deregulating the Health Care Industry*, was published in 1982. Professor Havighurst is Director of the Law School's Program on Legal Issues in Health Care, and he has served as Scholar in Residence at, and is a member of, the Institute of Medicine of the National Academy of Sciences. He has also been a resident consultant to the Federal Trade Commission in Washington, D.C., and is an Adjunct Scholar in Law and Health Policy of the American Enterprise Institute. He has also taught at Stanford, Northwestern, and Michigan. He will be on leave for the fall semester of 1983.



Donald L. Horowitz, A.B., LL.B., LL.M., M.A., Ph.D., Professor of Law

A.B. 1959, LL.B. 1961, Syracuse University; LL.M. 1962, M.A. 1965, Ph.D. 1967, Harvard University. A native of New York City, Professor Horowitz began his professional career as a judicial clerk in the United States District Court. With the exception of a stint as a government lawyer, he has primarily been engaged in research at such institutions as the Harvard University Center for International Affairs, the Council on Foreign Relations, the Brookings Institution, and the Smithsonian Institution. A recipient of a grant from the Guggenheim Foundation for work in ethnic relations, Professor Horowitz has published several books. Among them are *The Jurocracy*, a book about government lawyers, and *The Courts and Social Policy*, for which he was awarded the Louis Brownlow Prize of the National Academy of Public Administration in 1977. Professor Horowitz will be on leave, as a fellow of the National Humanities Center, during the spring semester of 1984.



F. William Hutchinson, A.B., J.D., Distinguished Advocate in Residence

A.B. 1939, Amherst College; J.D. 1948, University of Michigan. A native of Michigan, Mr. Hutchinson spent two years teaching secondary school, a year in business, and four years in military service between college and law school. His thirty years of private practice in Detroit and Grand Rapids, Michigan, were devoted primarily to the litigation of civil and criminal matters, largely in the federal courts. He joined the Duke law faculty in 1980, teaching courses in trial practice, negotiation, and professional responsibility. He also serves as Placement Counselor.



Sally Ann Cunningham Johnson, B.S., M.D., Lecturer in Law

B.S. 1977, Pennsylvania State University; M.D. 1976, Thomas Jefferson University. Dr. Johnson is Staff Psychiatrist at the Federal Correctional Institution in Butner and a Clinical Associate in the Department of Psychiatry at Duke. She is a diplomate of the American Board of Psychiatry and Neurology, and a member of a number of professional and learned societies. In addition to her other duties, she offers a course in clinical psychiatry for lawyers at the Law School.



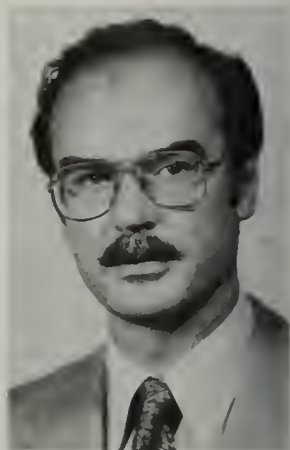
David L. Lange, B.S., LL.B., *Professor of Law*

B.S. 1960, LL.B. 1964, University of Illinois. Professor Lange practiced law with a Chicago firm that included media enterprises among its clients. He has also had substantial professional experience in radio, television, cable, and motion picture production, and is a member of the Governing Committee of the ABA Forum on the Entertainment and Sports Industries. He joined the Duke law faculty in 1971, where he has since served as General Editor of *Law and Contemporary Problems* and as Chairman of the Center for the Study of Communications Policy. His principal academic interests lie in the areas of entertainment and communications law as well as torts and the First Amendment.



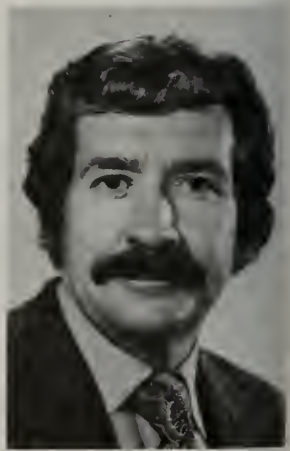
Lex K. Larson, B.A., J.D., *Lecturer in Law*

B.A. 1962, Haverford College; J.D. 1965, Harvard University. Extensively experienced in administrative law and employment discrimination litigation, Mr. Larson currently is chief executive officer of an employment law research firm. Prior to coming to Durham, he was in private practice in Washington, D.C. for fifteen years. He has wide expertise in scientific and technical fields, and has repeatedly served as counsel for major utilities before the Nuclear Regulatory Commission and its predecessor, the Atomic Energy Commission.



Eugene J. McDonald, B.S., J.D., LL.M., *Senior Lecturer in Law*

B.S. 1954, J.D. 1957, University of San Francisco; LL.M. 1958, Georgetown University. Mr. McDonald is from San Francisco, California. He practiced law privately in that city for five years with the firm of Brobeck, Phleger & Harrison before taking the presidency of the Human Resources Development Corporation in Washington, D.C., in 1965. In 1968, he became Vice-President and General Counsel of the parent International Textbook Company, and in 1972, he was promoted to Chief Executive of its International Division, located in London. In 1976, he attended the Advanced Management Program at the Harvard School of Business Administration. In 1977, he came to Duke as Vice-President for Governmental Relations and General Counsel, serving also as an adjunct member of the law faculty. He was previously Professor of Law on the Georgetown University law faculty and has also taught at the Universities of Virginia and San Francisco.



Richard C. Maxwell, B.S.L., LL.B., *Harry R. Chadwick, Sr., Professor of Law*

B.S.L. 1941, LL.B. 1947, University of Minnesota. Professor Maxwell is a native of Minnesota and served four years with the Navy. On leaving law school, he accepted a faculty appointment at the University of North Dakota, moving on to the University of Texas in 1949 and to the University of California at Los Angeles in 1953. In 1952-53, he was an attorney with Amerada Petroleum Corporation. He was the Dean at the University of California at Los Angeles from 1959 to 1969, and President of the Association of American Law Schools in 1972. In 1979, he joined the Duke law faculty. He has taught at many law schools, including Queen's University in Belfast, Columbia University, and the Universities of Minnesota and Singapore. He is an editor of the *Oil and Gas Reporter* and served as a member of the Committee on Gas Production Opportunities of the National Resources Council. He has published books on social legislation, secured transactions, and mineral law.



Michael Mirande, B.A., J.D., *Visiting Assistant Professor of Law*

B.A. (1975, Boston College), J.D. (1980, Duke University). After an outstanding record of achievement at Duke University School of Law, Professor Mirande began his professional career in 1980 as clerk for the Honorable Gerald Tjoflat, United States Court of Appeals for the Fifth (now Eleventh) Circuit. This was followed in 1981 by an appointment as Visiting Instructor of Administrative Law, Department of Political Science, Duke University. From 1981 to mid-1983, Professor Mirande was an associate in a Raleigh law firm. After a semester as an adjunct lecturer in legal ethics, he has joined the faculty of the Law School, and will be teaching civil procedure, legal research and writing, and legal ethics.



Robert P. Mosteller, B.A., J.D., M.P.P., *Associate Professor of Law*

B.A. 1970, University of North Carolina at Chapel Hill; J.D. 1975, Yale University; M.P.P. 1975, Harvard University. Professor Mosteller is a native of Vale, North Carolina. After serving as clerk in the United States Court of Appeals, Professor Mosteller joined the District of Columbia Public Defender Service as a staff attorney. During his service, he became Director of Training and Chief of the Trial Division. He has been active in the Bar of the District of Columbia, serving as Codirector of the Division on Criminal Law and Individual Rights in 1980-82, and of the Criminal Trial Practice Institute in 1979-80. He will be teaching Criminal Law, Evidence, and Trial Practice.



Jonathan K. Ocko, B.A., M.A., M.Phil., Ph.D., *Assistant Professor of Legal History*

B.A. 1966, Trinity College; M.Phil. 1971, M.A. 1972, Ph.D. 1975, Yale University. A native of New York City, Professor Ocko taught at Clark University and Wellesley College before joining the faculty of North Carolina State University in 1977. During the academic year 1978-79, he studied law at Harvard University, where he also taught Asian law. His principal scholarly efforts have been in the field of Chinese history and law. His book, *Bureaucratic Reform in Provincial China*, was published in 1982. In 1983, he was appointed to a part-time professional position in the Law School. During 1983-84 he will be a Rockefeller Humanities Fellow, preparing a study of the concept of justice in traditional China.



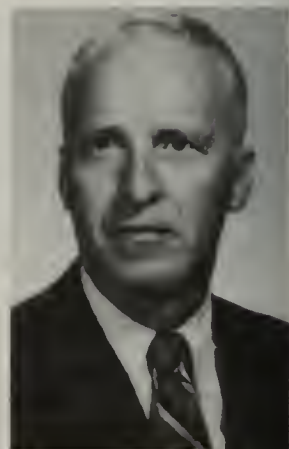
J. Francis Paschal, A.B., LL.B., A.M., Ph.D., *Professor of Law*

A.B. 1935, LL.B. 1938, Wake Forest College; A.M. 1942, Ph.D. 1948, Princeton University. A native of Wake Forest, North Carolina, Professor Paschal taught law there briefly following his graduation. In 1940, he commenced the study of politics, which was interrupted for four years of service in the Navy. After completing his doctorate in politics following the war, he returned to law as the Research Director for the North Carolina Commission for the Improvement of the Administration of Justice. From 1949 to 1954, he practiced law with a private firm in Raleigh. He joined the Duke law faculty in 1954. He has since served a term as Chairman of the North Carolina Civil Rights Commission and on the North Carolina General Statutes Commission. He has been Chairman of the University's Academic Council. He has written on a variety of legal subjects, including a full-length biography of Justice George Sutherland of the United States Supreme Court.



J. Dickson Phillips, Jr., B.S. J.D., *Distinguished Lecturer in Law*

B.S. 1943, Davidson College; J.D. 1948, University of North Carolina. Mr. Phillips' distinguished legal career began at the University of North Carolina School of Law, where he was Associate Editor of the *North Carolina Review*. After graduating he served as Assistant Director of the University of North Carolina Institute of Government (1948-49) and then entered private practice for ten years. He returned to the University of North Carolina in 1960, assuming the posts of Lecturer and then Associate Professor of Law (1960-1964). In 1964 he was appointed Professor of Law (1964-1978) and served as Dean of the Law School from 1964-1974. In 1978 he was appointed Judge, United States Court of Appeals for the Fourth Circuit. He has long been active in the governance of the North Carolina Bar Association, and has been a member of the North Carolina Wildlife Resources Commission. Judge Phillips teaches in the area of civil procedure.



William P. Pinna, B.S., J.D., Senior Lecturer in Law

B.S. 1966, De Paul University; J.D. 1968, Duke University. Mr. Pinna is a native of Chicago, Illinois. He is a Certified Public Accountant and was employed by Arthur Andersen & Company for four years. Since graduation from law school, he has practiced in Durham and Raleigh, concentrating in the areas of estate planning and tax law. He has also taught accounting and taxation at North Carolina State University since 1968, and has several times been named an outstanding teacher in that institution. He is active in the affairs of the American Bar Association, particularly in Economics of Law Practice Section.



Walter F. Pratt, Jr., B.A., D.Phil., J.D., Associate Professor of Law

B.A. 1968, Vanderbilt University; D.Phil. (Politics) 1974, Oxford University; J.D. 1977, Yale University. Professor Pratt is a native of Mississippi. He served for three years with the Army before his term as a Rhodes Scholar. He served as Articles Editor of the *Yale Law Journal* while completing work on his book, *Privacy in Britain*. He commenced his career in law with one judicial clerkship in the United States Court of Appeals, going on to another in the Supreme Court of the United States. He joined the Duke law faculty in 1979. His academic interests lie in the fields of legal history and contracts.



A. Kenneth Pye, B.A., J.D., LL.M., LL.D., L.H.D., Samuel Fox Mordecai Professor of Law

B.A. 1951, University of Buffalo; J.D. 1953, LL.M. 1955, LL.D. 1978, Georgetown University; L.H.D. 1979, Belmont Abbey College. Professor Pye is a native of New York. Following graduation from law school, he entered military service, after which he joined the law faculty of Georgetown University, where he served as Associate Dean from 1961 to 1966. He joined the Duke law faculty in 1966. He has taught at a number of other universities, including Johann Wolfgang Goethe University in Germany, Banares Hindu University in India, and Monash University in Australia. He became Dean of the Law School in 1968, serving for two years before becoming Chancellor of the University in 1970. He served for three years as University Counsel, served again as Dean of the Law School from 1974 to 1976, and again served as Chancellor from 1976 to 1982. He served as President of the Association of American Law Schools in 1977. He is known for his scholarship chiefly in the field of criminal procedure.



William Arneill Reppy, Jr., A.B., J.D., *Professor of Law*

A.B. 1963, J.D. 1966, Stanford University. Professor Reppy is a native of Oxnard, California. He commenced his professional career with two judicial clerkships—one in the Supreme Court of California, followed by another in the Supreme Court of the United States. He then practiced law for three years with a private firm in Los Angeles, until joining the Duke law faculty in 1971. He has also taught at the Universities of California and Michigan. He is a member of the Condominium Statutes Drafting Committee of the North Carolina Statutes Commission. His principal scholarly work is in the areas of marital property rights and conflict of laws.



Horace B. Robertson, Jr., B.S., J.D., M.S., *Professor of Law*

B.S. 1945, U.S. Naval Academy; J.D. 1953, Georgetown University; M.S. 1968, George Washington University. Professor Robertson is a native of Kannapolis, North Carolina. After five years as a line officer in the Navy, he was assigned to law study. After achieving a distinguished record, including service as Editor-in-Chief of the *Georgetown Law Journal*, he returned to active duty as a Judge Advocate, rising ultimately to be the highest ranking legal officer in the Navy in 1975. While on active duty, he served as a member of the United States Delegation to the United Nations Law of the Sea Conference in 1958 and to the United Nations Seabeds Committee's Preparatory Session in 1973. He joined the Duke law faculty in 1976. His primary teaching interests are in the fields of international law and torts.



Thomas D. Rowe, Jr., B.A., M.Phil., J.D., *Professor of Law*

B.A. 1964, Yale University; M.Phil. 1967, Oxford University; J.D. 1970, Harvard University. A native of Ann Arbor, Michigan, Professor Rowe achieved preeminent academic records both as an undergraduate and as a law student; in the interim, he was also a Rhodes Scholar. He commenced his professional career as a law clerk in the Supreme Court of the United States. He served for one and one-half years as Assistant Counsel to a Subcommittee of the United States Senate and then practiced law with a private firm in Washington, D.C. He joined the Duke law faculty in 1975 and became Associate Dean for Research in 1981. He has also taught at Georgetown University. He has written in the fields of constitutional law and civil procedure.



David Rudolf, A.B., J.D., Lecturer in Law

As an undergraduate Mr. Rudolf attended the London School of Economics and Rutgers University, where he was James McNall Burns Scholar in Political Science. He graduated *summa cum laude* in 1971, and then attended New York University School of Law. There he was Articles Editor of the *Annual Survey of American Law* and a member of the Order of the Coif. He received his J.D. *cum laude* in 1974. After graduation from law school he worked as a trial attorney for the Legal Aid Society of New York City, first with the Criminal Defense Division in state court and then with the Federal Defender Unit in the Eastern District of New York. From 1978 to 1982, Mr. Rudolf was on the faculty at the University of North Carolina School of Law, where he directed the Criminal Law Clinic. He is currently a partner in a Durham law firm.



Joyce S. Rutledge, B.A., M.A., Ph.D., J.D., Lecturer in Law

B.A. 1967, Goucher College; M.A. 1969, Ph.D. 1972, The Johns Hopkins University; J.D. 1981, Duke University. Ms. Rutledge was the recipient of several major awards and honors in the field of German literature before she undertook her legal training. While at Duke she was a member of the editorial board of *Law and Contemporary Problems*, and held several research assistantships. During 1981-82 she served as clerk for the U.S. Court of Appeals. Ms. Rutledge teaches Legal Writing and also serves as General Editor of *Law and Contemporary Problems* and the *Alaska Law Review*.



Richard L. Schmalbeck, A.B., J.D., Associate Professor of Law

A.B. 1970, J.D. 1975, University of Chicago. Professor Schmalbeck is a native of Chicago, where he began his professional career as an economist with the Illinois Housing Development Authority in 1971. In 1973, he returned to law school at the University of Chicago, where he served as Associate Editor of the *University of Chicago Law Review*. Following law school graduation, he practiced law briefly in Columbus, Ohio, before accepting a position in Washington in 1976 as a Special Assistant to the Associate Director of the Office of Management and Budget. In 1977, he returned to private practice with a law firm in Washington, specializing in federal income tax. He began his teaching career at Duke in 1980, where his focus is on the fields of federal taxation and law and economics.



Christopher H. Schroeder, B.A., M.Div., J.D., Associate Professor of Law
 B.A. 1968, Princeton University; M.Div. 1971, Yale University; J.D. 1974, University of California. Professor Schroeder is a native of Saginaw, Michigan. He served as Editor-in-Chief of the *California Law Review*. He practiced law with a San Francisco firm for two years before organizing a smaller firm in that city, where he engaged in environmental litigation in addition to a general litigation practice. He served as Director of the Energy and Environment Project of the Earl Warren Institute of the University of California and taught in the Energy and Resources Program and in the Law School of that university. He joined the Duke law faculty in 1979. He is also a Research Associate in the School of Forestry and Environmental Studies.



Cynia B. Shimm, A.B., M.D., Senior Lecturer in Psychiatry and Law
 A.B. 1945, Cornell University; M.D. 1950, Yale University. Dr. Shimm is a native of New York City. Following postgraduate medical training in pathology and internal medicine, followed by a stint of general practice, she pursued the study of psychiatry and psychoanalysis, in which specialties she has been certified. She has offered courses in psychiatry and law at Duke since 1974. She is Chairman of the Department of Psychiatry at Durham County General Hospital and is also a Clinical Professor of Psychiatry at the Duke University Medical Center.



Melvin G. Shimm, A.B., LL.B., Professor of Law
 A.B. 1947, Columbia University; LL.B. 1950, Yale University. Professor Shimm is a native of New York City and served three years with the Army. He practiced law privately in New York City from 1950 to 1951 and as an attorney for the Wage Stabilization Board in Washington, D.C., from 1951 to 1952 before entering law teaching as a Bigelow Fellow at the University of Chicago from 1952 to 1953. He has been at Duke since 1953, serving as Associate Dean since 1978. He has also taught at New York University and the Universities of Southern California, North Carolina, Michigan, and Texas. He has been heavily invested in the Law School's publication program, editing *Law and Contemporary Problems*, the *Journal of Legal Education*, and the American sections of the *Business Law Review* and the *Journal of Business Law*; and organizing and serving first as Faculty Editor and then as Faculty Adviser of the *Duke Law Journal*. He has also served as Senior Consultant with the Brookings Institution and as Director of the Association of American Law Schools' Orientation Program in American Law. His teaching interests lie primarily in the commercial law areas.



Allen G. Siegel, B.B.A., LL.B., Senior Lecturer in Law

B.B.A. 1958, College of the City of New York; LL.B. 1960, Duke University. A native of Chicago, Mr. Siegel commenced his legal career in private practice in Jacksonville, Florida, after which he served as an attorney for the National Labor Relations Board in its regional offices in Albuquerque and Atlanta. In 1964, he re-entered private practice with a large law firm in Washington, D.C., where he continues to devote himself to labor relations, with emphasis on collective bargaining in both the public and private sectors.



Bertel M. Sparks, B.S., LL.B., LL.M., S.J.D., Professor of Law

B.S. 1938, Eastern Kentucky University; LL.B. 1948, University of Kentucky; LL.M. 1949, S.J.D. 1955, University of Michigan. Professor Sparks has been, successively, Editor-in-Chief of the *Kentucky Law Journal*, 1948; Cook Fellow, University of Michigan, 1948-49; Special Agent, U.S. Army Counterintelligence Corps, 1941-45; Instructor in Law, 1949-50, Assistant Professor of Law, 1950-52, Associate Professor of Law, 1952-54, and Professor of Law, 1954-67, New York University; Visiting Professor of Law, University of Michigan, summer, 1956; and Visiting Professor of Law, University of Kentucky, summer, 1957. He came to Duke as a Visiting Professor of Law in 1966, and has been Professor of Law since 1967. He has also been a member of the Drafting Committee of the North Carolina General Statutes Commission since 1967. His writing includes two books, *Contracts to Make Wills* (1956) and *Cases on Trusts and Estates* (1965), and numerous articles in the fields of both law and economics.



Gwynn T. Swinson, B.A., J.D., Bradway Teaching Fellow

B.A. 1973, Antioch College; J.D. 1976, Antioch School of Law. Ms. Swinson has had extensive experience in representing the interests of the federal government in civil matters. Appointed Assistant Branch Director, Commercial Litigation Branch, Civil Division, U.S. Department of Justice in 1980, she previously served as trial attorney for the department's Commercial Litigation and Federal Programs Branches. Ms. Swinson is a member of the Board of Governors of the Antioch School of Law, and serves on the Board of Directors of the North Central Legal Assistance Program. She will be teaching in the area of criminal and civil trial practice.



William W. Van Alstyne, B.A., J.D., LL.D., *William R. Perkins and Thomas C. Perkins Professor of Law*

B.A. 1955, University of Southern California; J.D. 1958, Stanford University; LL.D. (Hon.) 1976, Wake Forest University; LL.D. (Hon.) 1979, College of William and Mary. Professor Van Alstyne is a native of Chico, California. He was professionally employed first by the California Department of Justice and then by the United States Department of Justice. He began his teaching career at Ohio State University in 1959, coming to Duke in 1965. He has taught at a number of other law schools, including Stanford University and the University of California at Berkeley and at Los Angeles, and at the Universities of Illinois and Pennsylvania. He studied at the Hague Academy of International Law in 1961 and was a Senior Fellow at Yale in 1964-65. He has long been active in civil rights and in the affairs of the American Civil Liberties Union. He has been especially active in the American Association of University Professors, of which he served as President in 1975-76. He is widely known for his writing and his speaking on the subject of constitutional law.



Garry D. Watson LL.B., LL.M., *Visiting Professor of Law*

LL.B. 1962, University of Melbourne (Australia); LL.M. 1966, Yale University. A native of Melbourne, Australia, Professor Watson's first teaching appointments were at the University of Melbourne (1963-64) and at the University of Pennsylvania (1964-65). In 1966 he joined the Osgoode Hall Law School of York University, Toronto, Canada, where he is currently a professor. He has also taught at the University of Toronto and at the University of Southern California. Since 1976 he has served as Counsel (reporter) to the Ontario Procedure Revision Committee. He was a member of the New Brunswick Civil Procedure Revision Committee in 1980-82. He has published extensively in the field of civil procedure and is a coeditor of *Canadian Civil Procedure: Cases and Materials*. In addition to his work in civil procedure, Professor Watson teaches trial advocacy and has prepared a Canadian edition of Broun and Seckinger, *Materials for Trial Advocacy* which has subsequently been translated into French. He is presently working on a book on Canadian civil procedure.



John C. Weistart, A.B., J.D., LL.D., *Professor of Law*

A.B. 1965, Illinois Wesleyan University; J.D. 1968, Duke University; LL.D. (Hon.) 1981, Illinois Wesleyan University. Professor Weistart was Editor-in-Chief of the *Duke Law Journal*. He served for a year as a judicial clerk on the Supreme Court of Illinois before joining the Duke law faculty in 1969. He served for three years as Editor of *Law and Contemporary Problems* and as American Editor of the *Journal of Business Law*, and is a member of the American Law Institute. He has also taught at the Universities of California at Los Angeles, Virginia, Harvard, and Michigan. He is known for his writing in the field of commercial law, and has served as a consultant to the Federal Trade Commission and the Federal Reserve Board.



Emeriti

John S. Bradway, A.B., A.M., LL.B., LL.D., *Professor of Law Emeritus*

A.B. 1911, A.M. 1915, LL.D. 1957, Haverford College; LL.B. 1914, University of Pennsylvania. General Practice, 1914-29; Legal Aid Society of Philadelphia, 1914-20; Chief Counsel, Philadelphia Legal Aid Bureau, 1920-22; Secretary, National Association of Legal Aid Organizations, 1923-40, President, 1940-42; Visiting Professor of Law and Director of the Legal Aid Clinic, University of Southern California, summer, 1928; Professor of Law and Director of the Legal Aid Clinic, University of Southern California, 1929-31; Vice-President, North Carolina Bar Association, 1945-46; Visiting Professor, University of North Carolina School of Social Work, 1949-59. Professor of Law and Director of the Legal Aid Clinic, Duke University, 1931-59; Professor of Law Emeritus since 1959.

Edwin C. Bryson, LL.B., *Professor of Law Emeritus*

University of North Carolina, 1922-25; Duke University, 1932-33; LL.B. 1937, University of Oregon. General Practice, 1927-30. Assistant to Duke University Legal Aid Clinic, 1931-47. Duke University Counsel, 1945-71; Associate Professor of Law, 1947-54; Professor of Law, 1954-71; Professor of Law Emeritus, since 1971.

Kazimierz Grzybowski, M.L.L., D.L.L., S.J.D., *Professor of Law Emeritus*

M.L.L., 1931, Doctor of Law and Political Science, 1934, University of Lwow; S.J.D., 1933, Harvard University. Associate Professor School of Law and Graduate School of Diplomacy, University of Lwow, 1936-39; Judge of the District Court of Lwow; Military Service, 1939-48; Director, Polish Information Service, Middle East, Jerusalem, 1942-45; Editor, Law Library, Library of Congress, Washington, D.C., 1951-60; Consultant, Social Science Division, Rand Corporation, Santa Monica, California, 1960-62; Visiting Professor, Michigan Law School, 1961-62; Visiting Professor, Yale Law School, 1962-63; Visiting Professor, Leiden University, Leiden, The Netherlands, 1963-64; Visiting Professor, Strasbourg University, Strasbourg, France, 1967. Professor of Law and Senior Research Associate, Rule of Law Research Center, Duke University School of Law, since 1965.

Arthur Larson, A.B., B.A., M.A., B.C.L., J.D., D.C.L., LL.D., L.H.D., *James B. Duke Professor of Law Emeritus*

A.D. 1931, LL.D. 1953, Augustana College; B.A. 1935, M.A. 1938, B.C.L. 1957, D.C.L. 1957, Oxford University. General Practice 1935-39; Assistant Professor of Law, University of Tennessee 1939-41; Division Counsel, Office of Price Administration, 1941-44; Chief, Scandanavian Branch, Foreign Economic Administration 1944-45; Associate Professor of Law, Cornell University, 1945-48; Professor of Law, 1948-53; Dean and Professor of Law, University of Pittsburgh, 1953-54; Undersecretary, United States Department of Labor, 1954-56; Director, United States Information Agency, 1956-57; Special Assistant to the President, 1957-58. Professor of Law and Director of the Rule of Law Research Center, Duke University, 1958-80; James B. Duke Professor of Law Emeritus since 1980.

Elvin R. Latty, B.S., J.D., J.Sc.D., *William R. Perkins Professor of Law Emeritus and Dean Emeritus*

B.S. 1923, Bowdoin College; J.D. 1930, University of Michigan; J.Sc.D. 1936, Columbia University. Instructor in Romance Languages, University of Vermont, 1923-27; General Practice, 1930-33; Special Fellow, Columbia University, 1933-34; Associate Professor of Law, University of Kansas, 1934-35; Professor of Law, University of Missouri, 1935-37; Visiting Professor of Law, George Washington University, summer, 1937, Stanford University, summer, 1938, University of North Carolina, summer, 1942, 1947, 1949, 1956, University of Texas, summer, 1951, University of Puerto Rico, spring, 1968, University of Florida, summer, 1970; Fulbright Lecturer, University of Pavia, Italy, 1954; Special Assistant to the American Ambassador, Caracas, 1942-43; Acting Assistant Chief, Foreign Funds Control Division, United States Department of State, 1943. Professor of Law, Duke University, 1937-73; Dean, 1958-66; William R. Perkins Professor of Law Emeritus and Dean Emeritus, since 1973.

Charles H. Livengood, Jr., A.B., J.D., *Professor of Law Emeritus*

A.B., 1931, Duke University; J.D. 1934, Harvard University. General practice, 1934-40, 1945-48; Regional Attorney for the Seventh Region, Wage and Hour Division, U.S. Department of Labor, 1940-41; Chief of the Wage-Hour Section, Office of the Solicitor of Labor, 1941-42; Visiting Professor of Law, University of North Carolina, summer, 1948, 1967-68, George Washington University, summer, 1949, 1956; Fulbright Lecturer, University of Sydney, Australia, 1958-59; member, American Law Institute, since 1947; Consultant, U.S. Senate Subcommittee on Labor-Management Relations, 1950; Associate Editor, Journal of Legal Education, 1951-52; public member, Wage Stabilization Board, Region III, 1952-53; member, National Academy of Arbitrators, since 1953; member, North Carolina General Statutes Commission, since 1966, Chairman, since 1970; Secretary, Section of Labor Relations Law, American Bar Association, 1967-68; Lecturer in Law, Duke University School of Law, 1946-48; Associate Professor of Law, 1948-51; Professor of Law, since 1951.

Admissions



The admissions process for the typical law school applicant is at best onerous. It occasionally creates severe anxiety. The Law School is aware of the difficulties and uncertainties faced by applicants, and strives to treat each applicant with fairness and candor. The following description of the admissions process at Duke is presented with that object in mind.

Admissions Standards: J.D. Program

At Duke, as at many law schools, the three most important criteria, in the order of their importance, are the Law School Admission Test (LSAT) score, the undergraduate grade point average (GPA), and the undergraduate institution attended.

Although reliance on purely academic criteria is appropriate in making some decisions, particularly those involving candidates either clearly admissible or clearly inadmissible, the majority of applications fall between these extremes. For these applications, Duke will give careful consideration to more subjective factors such as proven capacity for leadership, dedication to community service, excellence in a particular field, motivation, graduate study in another discipline, work experience, extracurricular activities, and personal and character information provided in letters of recommendation. Also, in interpreting the applicant's GPA, it is often necessary to make judgments regarding the strength of the course of study pursued and the significance of class rank or the progression of grades.

Although no quotas of any kind are employed in the admissions process, the Law School does make a conscious effort to achieve a broad diversity in each entering class in terms of general background, geography, and undergraduate institutions represented. An individual student may be selected not only for his or her marked potential for academic success, but also because application materials indicate that he or she can bring to Duke unique personal qualities or talents that will enhance the overall character of the entering class.

Duke has a faculty-initiated affirmative action plan for minority admissions, and special care is taken in evaluating applications from members of minority groups who traditionally have not been well represented in the legal profession. On occasion, special consideration is given to children of alumni of Duke University who are qualified to do acceptable work. Female applicants are evaluated according to the same standards as male applicants, and applications from women are encouraged.

An applicant who has been graduated from an accredited college, or one who will have been graduated from an accredited college during his or her course of study

at the Law School, may be admitted as a candidate for the degree of Doctor of Law (J.D.). On rare occasions, an exceptionally qualified applicant may be admitted despite the lack of an undergraduate degree; such an applicant must, however, be admitted as a candidate for the degree of Bachelor of Laws (LL.B.).

For both more detailed and more general information on law school admission, prospective applicants are advised to consult the most current issue of the *Prelaw Handbook*, published by the Law School Admission Council and the Association of American Law Schools. It includes material on the law and lawyers, the study of law, prelaw preparation, applying to law school, and a complete Law School Admission Test, together with individual information on most American law schools. The *Prelaw Handbook* may be obtained at college bookstores or ordered from the Educational Testing Service, Box 40, Newtown, Pennsylvania 18940.

Admission Procedures: J.D. Program

The Admissions Committee receives its authority by delegation from the law faculty and reports to the law faculty. The committee, composed of four law professors and three law students, decides policy questions arising in the admissions process. Student members of the committee, however, do not review individual files. All individual applications are reviewed by the Assistant Dean responsible for admissions.

Each applicant is responsible for the collection and submission, together with the school's application for admission, the following documents:

1. Completed application form obtained from the Office of Admissions, Duke Law School, Durham, North Carolina 27706. A recent photograph must be attached to the application.
2. The Law School Application Matching Form which is issued to each applicant taking the Law School Admission Test.
3. Three completed reference forms, one of which should be written by an appropriate academic dean at the undergraduate school last attended. A statement of the applicant's rank in class will be helpful. It is suggested that the other reference forms be written by professors who have personal knowledge of the academic performance and potential of the applicant. Applicants who have been out of school for some time may substitute letters from employers or others who know them well.
4. A nonrefundable processing fee of \$45. This application fee is not waivable except in cases of extreme personal hardship.
5. Financial aid forms, if the applicant wishes to be considered for any type of financial assistance.

Confidentiality envelopes are also provided for the three required references. *The application must be entirely ready for processing and evaluation when it arrives.*

Applicants are generally required to take the Law School Admission Test (LSAT) no later than December. Application forms and information should be procured by writing directly to Law School Admission Test, Educational Testing Service, Box 40, Newtown, Pennsylvania 18940.

Applicants must arrange for the submission of transcripts from all undergraduate and graduate schools attended to the Law School Data Assembly Service (LSDAS), Educational Testing Service, Box 40, Newtown, Pennsylvania 18940.

Only on rare occasions are applications accepted after February 1. To avoid this disappointment, we strongly recommend that applicants apply between September 1 and January 1.

Personal interviews are not required. Interviews may be arranged, however, if there are special circumstances that cannot be adequately described in writing. It is

Duke's assumption that the usual purpose for an interview is to provide the applicant with information about the school.

Each applicant extended an offer of admission will be given at least three calendar weeks to respond. No applicant who receives an offer of admission will be required to make a final decision on the offer prior to April 1. Only in rare cases will offers be extended prior to February 1 or after May 15. After May 15, a waiting list is normally established and held open until a few days prior to fall semester registration. Offers are extended to applicants on the waiting list as withdrawals occur.

An offer of admission is made subject to the following conditions:

1. The applicant is required to pay a deposit of \$250, on or before the date specified in the letter of acceptance, to reserve a place in the entering class until July 10. Half of this deposit (\$125) will be refunded if the applicant notifies the Assistant Dean for Admissions, in writing, of a change in plans before May 15. *No refund will be made thereafter.*
2. The applicant is required to make a firm personal decision, on or before July 10, to promise not to withdraw after that date for any reason that might be foreseen and avoided before that time. The applicant's notarized signature on the school's commitment form constitutes a solemn commitment to attend Duke. If a firm commitment to enroll cannot be made by July 10, the applicant is required to pay an additional deposit of \$500 to reserve a place in the entering class. This amount will be credited to tuition in the event of enrollment. *No portion of this deposit will be refunded if the applicant decides not to enroll.*

Admission Procedures: J.D.-M.A. Summer Semester Program

Admission to the summer-entering program is not different from admission to the regular J.D. program commencing in the fall semester. Application for this program of study should be made to the Law School; the class will be selected by the Law School with the assent of the Graduate School departments. An offer of admission for June entrance is made subject to two conditions:

1. The applicant is required to pay a deposit of \$250, on the date specified in the letter of acceptance, to reserve a place in the class. This deposit is nonrefundable and will be credited toward the summer semester's tuition.
2. The applicant must complete and return an Admission Contract, and Summer Semester Enrollment Form, along with the \$250 deposit.

Joint Degree Programs

Applicants for any of the joint degree programs offered by the Duke Law School are considered for admission to both schools on the same basis as those applicants who are applying for the individual programs. The admission decision of one school has no bearing on the admission decision of the other school. If accepted for admission by both schools, the applicant is automatically eligible to participate in the established joint degree program.

Master of Arts in Legal Studies

Admission to this degree program is limited to persons who have achieved distinction in law-related professional work or who are pursuing law-related graduate degrees in other units of Duke University. Application to the program proceeds in exactly the same manner as for the J.D. program, with the single exception that the LSAT is not required of applicants who have taken the Graduate Records Examination in their primary field of study.



Reactivating Admissions Files

If an applicant has applied for admission in a previous year and was not extended an offer of admission or chose not to enter during that academic year, he or she may request that the file be reactivated for consideration by the Admissions Committee. A nonrefundable fee of \$45 is charged for processing the application, and a check or money order for this amount must accompany the request for reactivation of the file. The applicant must also reregister with the Law School Data Assembly Service (LSDAS), Educational Testing Service, Box 40, Newtown, Pennsylvania 18940.

Transfer Policy

In order to be considered for admission to Duke, a transfer applicant must present evidence of the satisfactory completion of one year of study at any law school that is a member of the Association of American Law Schools, and be eligible for readmission to that school. To be given serious consideration for admission, an applicant should rank in the top third of the class. Two academic years of law study must be completed at Duke. Adjustment of credit for work done in another law school is made by the Dean or the faculty Administrative Committee.

The following items are required to complete a transfer applicant's admission file:

1. \$45 processing fee;
2. Letter of certification from the Dean of the law school attended;
3. Transcript of all grades earned in the first year of law school;
4. The applicant must reregister with LSDAS.

Ordinarily, it should not be expected that action will be taken upon transfer applications before July. Spring semester grades must be received by us before decisions can be made.

Graduate Study in Law

Only international students are normally admitted to Duke to pursue law study beyond the basic professional degree. For information about application to the graduate study program, see the section on international students.

University and Law School Rules

Students are subject to the rules and regulations of the University and the Law School that are currently in effect, or those that in the future may be promulgated by the appropriate authorities of the University. Every student, in accepting admission, indicates a willingness to subscribe to and be governed by these rules and regulations. The student also acknowledges the right of the University to take such disciplinary action, including suspension and/or expulsion, as may be appropriate, for failure to abide by these rules and regulations, or for other conduct adjudged unsatisfactory or detrimental to the University.

Financial Information



The cost of providing a legal education of the quality offered by Duke is high and has been steadily increasing. An annual report of the Law School explains in moderate detail what those costs are, and how they are met; a copy is available on request. As the report reveals, the Law School is substantially subvented by the University from its endowment sources. In addition, the Law School has some resources of its own, including generous annual giving support from its alumni. Nevertheless, the bulk of the cost of the program must be borne by the students who receive it.

Tuition

For the academic year 1983-84, entering students in the J.D. program or the M.A. in Legal Studies Program will pay a full year's tuition of \$8,000 for their first year of study. Students pursuing graduate degrees will pay \$8,500 for their single year of resident study.

Subsequent years of study toward the J.D. program will be billed at the current tuition rate. In recent years, that rate has been significantly increased each year. Students in joint degree programs will be billed tuition at rates appropriate to their particular programs.

Entering students must pay their tuition in full before the first day of class and will receive no refund in the event of withdrawal. The reason for this policy is to discourage tentative enrollment which may have the effect of depriving another student of the opportunity to enroll. After the first semester, students are billed for their tuition on the first day of class; if they withdraw after the semester has commenced, they may be entitled to a substantial refund in accordance with University policy.

Other Fees

Late Registration/Late Payment Charges. Students who register in any semester at a date later than that prescribed are required to pay to the Office of the Bursar a \$25 penalty for late registration. A monthly invoice will be sent to students for any outstanding charges on their University account. A penalty of 1 1/3 percent will be assessed on past-due amounts until cleared.

Student Health Fee. A student health fee of \$170 (\$85 per semester) is charged to all Duke University students. Optional Health Insurance is available. The cost is \$125 for a single student, \$150 for married student coverage. These figures are approximations.

Athletic Events Fee. Law students may secure admission to all regularly scheduled University athletic contests, with the exception of football and basketball, held

on University grounds during the entire academic year free of charge. A fee of \$15 is charged for football events only and \$50 for football and basketball. This fee is payable in the fall semester. Students may also use the facilities of the Duke golf course upon payment of student green fees.

Duke Bar Association Fee. A \$10 fee each semester is due and payable not later than the day of registration for a particular semester. This fee is utilized exclusively to support the activities of the student bar association.

General Expenses

Applicants should be aware that the following general expense estimates were compiled in the spring of 1983, and for future years appropriate revisions may be necessary to reflect inflationary increases. It should also be recognized that the expenses of a Duke law student may vary considerably according to the style of living assumed, travel distance, and size of family, if any. With the above cautionary statements in mind, the following are the best estimates of total living costs for a nine-month academic year including tuition: approximately \$15,260 for single students; approximately \$18,970 for married students; and approximately \$21,670 for married with one child. Included in the above cost-of-living estimates are current expense levels for tuition, lodging, board, books (approximately \$675 if purchased new), supplies, transportation, and personal effects. Applicants for scholarships and federal loans should be aware that their proposed budget figures cannot exceed the above amounts.

Debts

No records are released and no student is considered by the faculty as a candidate for graduation until all indebtedness to the University is settled with the Bursar.

Scholarship Assistance

Professional education is expensive. Unfortunately, the Law School must rely upon students to bear the primary burden of this cost, with such help as they may receive from families, governments, or other organizations. The Law School, however, does provide a number of substantial scholarships to entering students.

Merit Awards. The Law School competes for students with several fine institutions which enjoy longer traditions of excellence. In order to assure each entering class that it will have a solid core of outstanding members who are admissible to any law school, there are a number of awards made each year which are based on merit. Merit, for this purpose, is usually defined as extraordinary academic promise manifested by grades *and* test scores which are substantially above the class medians. But merit, for this purpose, also includes extraordinary achievement or unusual experience or background. It is not to be supposed that persons receiving such awards are more meritorious, in the broadest sense of that word, than many other entering students whose admissions credentials may seem a bit less unusual. Indeed, many students who do not receive merit awards will prove to be more deserving of praise as law students. But, it is believed, all students at the school are benefited by the solid assurance given that Duke law students as a group are among the ablest to be found anywhere.

While financial circumstance is a factor in awarding some of these scholarships, the primary purpose of these awards is to assure the quality of the entering class. Students receiving such awards are generally those who reasonably can be expected to make significant contributions to the community, by reason of their exceptional academic promise, extraordinary achievements, and valuable experience or background.

These scholarships are funded from five sources:

William Neal Reynolds Scholarships were established by the Z. Smith Reynolds Foundation in honor of the brother of R. J. Reynolds, the founder of the tobacco company.

Bunyon S. Womble Scholarships were established by the Womble family in honor of the founder of a North Carolina law firm.

James A. Bell Scholarships were established by the Bell family in honor of a federal judge.

Elvin R. Latty Scholarships were established by alumni and friends in honor of a former Dean of the Law School.

Dunspaugh-Dalton Foundation Scholarships were established by a Miami foundation.

Need Awards. The Law School also provides a number of smaller scholarships that are intended primarily to aid those students who are most in need of financial assistance. In order to qualify for assistance of this kind, students must have a report prepared for the Law School by the Graduate and Professional School Financial Aid Service (GAPSFAS), Box 2614, Princeton, New Jersey 08540. Parental participation in the GAPSFAS report is mandatory, regardless of whether the applicant declares "independent" or "dependent" status. The Law School fully recognizes that many students are independent of their families for all purposes, but in choosing among competing student needs, those that cannot be met by parents will be accorded priority.

These scholarships are funded from seven sources:

Neill Blue Memorial Scholarships were established in memory of a law student who suffered a tragic death in 1971.

Jenny Ferrara Scholarships were established by Vincent L. Sgroso, of the Class of 1962, in honor of his grandmother.

John R. Parkinson Scholarships were established by the Parkinson family.

Anna Pierce Stafford Scholarships were established in honor of members of the family.

South Carolina Law Alumni Scholarships were established by South Carolina Alumni.

The Hunton and Williams Scholarship was established by the law firm of Hunton & Williams, through its Raleigh, North Carolina office.

University Scholarships were established by the University from general endowment funds.

Students seeking aid on the basis of need should file a financial aid application at the same time that they apply for admission. An attempt will be made simultaneously to inform all such applicants of both the admissions and scholarship decisions, although some decisions concerning scholarships will be made at a later time. The fact that a student has applied for financial aid will not affect the decision on the application for admissions.

Upperclass Awards

A few scholarships are also awarded each year to second- or third-year students who have outstanding records in law school and who demonstrate substantial need that cannot be met from other sources.

These scholarships are funded from four sources:

David H. Siegel Scholarships were established by Allen G. Siegel, of the Class of 1960, in memory of his father.

Richard M. Nixon Scholarships were established by the Class of 1937 to honor their classmate, the former President of the United States.

The Miller and Chevalier Charitable Foundation Scholarship was established by a Washington, D.C. law firm.

Some awards to upperclass students are made from the Law School's general endowment fund.

All students who apply for aid each academic year are automatically considered for these scholarships.

Loan Assistance

Students who need loan funds to help finance their legal education must also submit a financial aid application at the time admission is sought. When applicants receive an offer of admission they will generally know the amount and kind of financial assistance available. In relation to the earliest acceptances, however, there may be a brief delay in determining the student's eligibility for loans because of the several sources of information which must be coordinated. The appropriate loan application and a request for any additional documentation required will be sent to the student when the student confirms his or her place in the entering class and accepts the financial aid offer.

Incoming students applying for loans administered or certified by Duke University are required both to submit certified or notarized copies of their income tax returns (Form 1040) for the previous year for themselves and for their parents and to participate in the Graduate and Professional School Financial Aid Service (GAPSFAS). The GAPSFAS report should be completed and directed to the school as soon as the student can supply all needed information. Reports arriving after April 30 may disadvantage the student. Income tax returns are not required at the time of application, but will be requested later. Information and application material for GAPSFAS may be obtained by writing Educational Testing Service, Box 2614, Princeton, New Jersey 08540.

After the first year, an independent student is not required to submit parental information, but must still submit a GAPSFAS report, or any other test of eligibility required by federal regulations, containing his or her personal information.

At this time the following loan sources are either administered by Duke University or are available to Duke law students. Approval of any loan application is based on financial need and satisfactory scholastic standing.

National Direct Student Loan Program Loans. Loans are available to Duke law students through the National Direct Student Loan (NDSL) Program, assuming the continuation of appropriations by Congress for this purpose. Interest on these loans, at a rate of 5 percent, begins to accrue six months after the student leaves the Law School, and repayment usually begins at that time. Complete repayment is scheduled over a period of up to ten years. Duke administers all NDSL loan funds allocated to it under strict federal guidelines dealing with such issues as the amount of parental income, reasonableness of budgets, complete disclosure of assets, and emancipation within the meaning of the applicable federal regulations. A GAPSFAS report is required to determine NDSL eligibility.

Federally Insured Student Loan Program. This program allows a student with demonstrated need according to the GAPSFAS report or a newly created federal need analysis to borrow up to \$5,000 per year at a 9 percent interest rate. Interest on these loans will be paid by the government while the student is in school. As with the NDSL, a six-month grace period after graduation is permitted before repayment must begin. A student will have a maximum of ten years following graduation or withdrawal from the University to repay the loan. A student seeking a FISL is required by Duke University first to apply for necessary funding to the appropriate governmental agency in the student's home state. If this agency denies the request, a letter from the

agency certifying this determination must be submitted to the Law School which will then consider the applicant for a FISL. This policy has been adopted by the University owing to a drastic reduction in available loan funds, which are inadequate to meet the needs of all students seeking loans.

State Guaranteed Loans. Most states have established guaranteed loan programs for graduate and undergraduate study for their own residents. The terms of such loans, the methods of administration, and the availability of funds vary widely among the various states. For the most part the federal need analysis is now required for these loans. You should consult your state to determine its exact requirements. The Law School will supply information regarding the appropriate agencies to contact in each state and will also make appropriate certifications in support of the loan applications of individual students applying for state guaranteed loans.

Work Study

The Law School also receives a limited amount of federal work-study funds each year. The school does not recommend that first-year students work, so these funds are reserved for second- and third-year students. A few positions using work-study funding are available each summer, usually at the Law School, but sometimes with federally approved agencies off campus. Students must acquire these jobs on their own, then seek funding early in the spring from the financial aid office. Students need to be aware that since work-study is a type of federal aid, they are required to save 60 or 80 percent (depending on the city where they work) of their summer work-study earnings, and these savings become a part of the next academic year's aid package. Academic year work-study is automatically allocated as a part of the student's aid if funds are available.

Curriculum



First-Year Curriculum

The following first-year courses are required of all J.D. and LL.B. candidates:

Courses	Credits
Civil Procedure	5
Constitutional Law	5
Contracts	5
Criminal Law	3
Lawyers and Clients	1
Property	5
Torts	5
Tutorial in Research and Writing	<u>2</u>
	31

Each first-year course will be divided into a combination of large, medium, and/or small sections. Each first-year student will be assigned in one of his or her courses to a small section, normally numbering not more than twenty-five, and in the balance of his or her courses to medium or large sections. The tutorial program is offered in conjunction with the small sections of the first-year courses.

FIRST-YEAR COURSES

110. Civil Procedure. A consideration of the basic problems of civil procedure designed to acquaint students with the fundamental stages and techniques of litigation—e.g., pleading, discovery, trial, appeal, judgments, and multiparty actions—and to introduce them to underlying problems such as jurisdiction, choice of law in a federal system, and the roles of courts as law-making institutions. 5 s.h. *Paschal, Carrington, Mirande, or Watson*

120. Constitutional Law. An examination of the distribution of and limitations upon governmental authority under the Constitution of the United States. Included are study of the doctrine of judicial review of legislative and executive action, the powers of Congress and the President, the limitations on state governmental powers resulting from the existence or exercise of congressional power, and judicial protection against the exercise of governmental power in violation of rights, liberties, privileges, or immunities conferred by the Constitution. 5 s.h. *Van Alstyne, Dellinger, or Rowe*

130. Contracts. The formation and legal operations of contracts, their assignment, their significance to third parties, and their relationship to restitution and commercial law developments; the variety, scope, and limitations on remedies; and the policies, jurisprudence, and historical development of promissory liability. 5 s.h. *Weistart or Van Alstyne*

140. Criminal Law. An introductory study of the law of crimes and the administration of criminal justice, including analysis of the criminal act and the mental element in crime, consideration of specific offenses as defined by statute and the common law, and discussion of typical defenses in relation to specific crimes. One of the purposes of the course is to introduce the students to the nature of social control mechanisms and the role of law in a civilized society. 3 s.h. *Beale or Mosteller*

150. Lawyers and Clients. One-week intensive course in professional responsibility. 1 s.h. *Bartlett, Hutchinson, Swinson, Mirande, or Cotter*

160. Property. A study of the basic concepts of real property law and conveyancing, including historical background; estates in land, including the fee simple, the fee tail with its statutory substitutes, the life estate, the estate for years, and other non-freeholds; concurrent ownership; types of future interests; conveyances before and after the Statute of Uses; landlord and tenant; the modern deed—kinds, delivery, description, title covenants, and agreements running with the land at law and in equity; easements; and recording and title registration. 5 s.h. *Maxwell or Sparks*

170. Torts. An analysis of liability for personal injuries and injuries to property. The law of negligence occupies a central place in the course content, but the course also considers other aspects of tort liability such as strict liability, liability of producers and sellers of products, nuisance, liability for defamation and invasion of privacy, and commercial torts. The subjects of causation, damages, insurance (including automobile no-fault compensation systems), and workmen's compensation are also included. 5 s.h. *G. Christie, Lange, or Ainsworth*

190. Legal Writing and Advocacy. Following instruction in legal research, students write five to seven papers (from client letters to formal appellate briefs) under close supervision of faculty member; at least one brief is argued orally. 1 s.h. fall and spring. *Staff*

SUMMER ENTERING PROGRAM

A summer program in law, philosophy, and economics will begin at Duke in the summer of 1983, and will be conducted initially on an experimental basis. The program's purpose is to combine law, philosophy, and economics in a coherent format and in so doing give to the students participating in it a broader perspective than is usually gleaned from the study of a single discipline. Prospective students interested in this program should so indicate on their applications to the Law School.

Capsule descriptions of the courses of study follow:

Seminar in Applied Economics. An exploration of the role of law in shaping the environment in which economic decisions are made. The tools of microeconomic analysis that are most appropriate to understanding and predicting the consequences of alternative legal arrangements include consumer and producer choice theory, capital theory, general equilibrium theory, the analysis of uncertainty, imperfect competition, public goods and externalities. Quantitative methods will be developed and used to apply these tools to a wide variety of legal problems including antitrust policy, public utility regulation, crime control, tort law, products liability, contract remedies, discrimination, environmental protection, labor law, and patents. This course satisfies prerequisites for further graduate work in economics (6 units). The course will be taught by Professor Graham of the Department of Economics.

The philosophy summer program consists of two consecutive five-week courses, a seminar in legal philosophy followed by an independent study course. One grade will be given for both courses, based upon class participation in the seminar and a research paper produced by the end of the independent study. Both courses will be taught by Professor Golding of the Department of Philosophy.

Philosophy of Law. Study of theories of the nature of law and their relevance to such topics as legal reasoning, the justification of punishment, the relationship between law and morality, and the limits of law. Three class meetings per week for five weeks. Lectures and presentations of student reports.

Legal Theory. Each student will select a problem for investigation. Consultation with the instructor on a regular basis. A research paper will be due at the end of this course.

Second- and Third-Year Curriculum

In the absence of special authorization from the Dean, each student is required to take in each semester courses aggregating not less than twelve and not more than sixteen semester-hours.

The program in the second and third years is entirely elective. In planning his or her program, however, the student should bear in mind that certain more basic courses may be prerequisites to other more advanced courses, and that for this reason—as well as to avoid possible schedule conflicts—it is generally advisable to take these more basic courses in the second year.

UPPERCLASS COURSES

200. Administrative Law. A study of administrative agencies and legislative authority, information gathering and withholding, rule-making and order-formulating proceedings, judicial review of administrative action, and constitutional limitations on administrative powers. 3 s.h. fall. *Schroeder*

400. Admiralty. An examination of the special body of law governing maritime affairs, especially the transportation of goods and passengers by water. Included in this coverage are admiralty jurisdiction, marine insurance, carriage of goods, charter parties, general average, rights of injured seamen and others, collision, salvage, maritime liens and ship mortgages, limitations and liability, and governmental activity in shipping. 2 s.h. fall. *Paschal*

415. American Legal History. A study of the development of fundamental American legal institutions and principles, with emphasis upon the relationships between changes in the law and other changes in American life. Students enrolled in this course will be required to read and report on one book about an aspect of American legal history. There will also be an examination at the end of the course. 3 s.h. spring. *Pratt*

205. Antitrust. A study of the federal antitrust laws and the policy of using competition to control private economic behavior. 4 s.h. spring. *Havighurst*

207. Athletics and the Legal Process. An examination of legal relationships in professional sports as a basis for developing concepts about the nature of the legal process. To be examined are the respective roles of private contract, collective bargaining, and private and public litigation to resolve conflicts both between players and clubs and among clubs themselves. The major concepts to be applied will be drawn from the areas of labor, antitrust, and contracts law. (Normally offered only in alternate years. Requires prior or concurrent enrollment in Labor Relations.) 2 s.h. spring. *Weistart*

255. Basic Federal Income Taxation. An introduction to federal income taxation, with emphasis on the determination of income subject to taxation, deductions in computing taxable income, the character of the income realized, and the proper taxpayer on which to impose the tax. 3 s.h. fall, *Gann*; or 4 s.h. spring. *Schmalbeck*

210. Business Associations. An examination of the state and federal law pertinent to corporations and, to a lesser extent, partnerships as business entities. Detailed attention is given to the legal ground rules for the life cycles of corporations—to their organization, preincorporation transactions, basic financial structure, internal governance arrangements, dissolution, and other fundamental changes. The contrasting approaches of Delaware, California, and the Model Business Corporations Act to the obligations and rights of officers, directors, and controlling stockholders are closely examined. Further, a detailed study is made of those portions of the federal securities law that most closely affect the organic law of the corporation—federal regulation of the proxy system and of tender offers and federal restraints on inside trading and on certain other transactions in securities. 4 s.h. spring. *Cox*

210. Business Associations. An examination of the state and federal law pertinent to corporations and, to a lesser extent, partnerships as business entities. Detailed attention is given to the legal ground rules for the life cycles of corporations—to their organization, preincorporation transactions, basic financial structure, internal governance arrangements, dissolution, and other fundamental changes. Further, a detailed study is made of those portions of the federal securities law that most closely affect the organic law of the corporation—federal regulation of the proxy system and of tender offers and federal restraints on inside trading and on certain other transactions in securities. Portions of the course are organized around a series of hypothetical problems designed to place the course materials in a realistic business-planning context and to emphasize the role of the corporate lawyer in facilitating clients' goals while minimizing adverse legal risks. Students are required to submit a written solution to one planning problem during the course. 4 s.h. fall. *DeMott*

300. Business Planning. Advanced work in corporation, partnership, and income tax law, securities regulation, and accounting. Attention is focused on a series of problems that commonly and currently face business lawyers in the formation and financing of business organizations; restructuring ownership interests and financing their withdrawal; share repurchases for insiders' strategy; sales and purchases of businesses; and merger and other enterprise combination, enterprise division, and dissolution. The problems are analyzed, and solutions are presented in class discussion and papers by an integrated approach that embraces the interplay of restraints posed by various areas of the law. Prerequisite: Corporate Taxation (may be taken concurrently). 3 s.h. spring. *Pinna*

215. Commercial Law. An integrated study of the law governing commercial transactions and emphasizing the application of the Uniform Commercial Code, particularly the articles dealing with commercial paper, bank deposits and collections, and secured transactions. Topics that are given particular attention include the function and incidents of common forms of negotiable instruments, the mechanics of the bank collection process, and the operation of retail credit systems. 4 s.h. spring. *Weisbart*

219. Communications Law and Policy. An introduction to the principal laws involved in mass media regulation. Coverage includes the law of the press; FCC jurisdiction over radio, television, cable, and satellite technology, and other selected subjects. (Normally offered in alternate years.) 2 s.h. fall. *Lange*

305. Comparative Law: The Civil System. A study of civil law systems, focusing on legal institutions and methodology; the course will examine the origins of common and civil law systems and analyze typical substantive features of civil law. 3 s.h. fall. *Bernstein*

310. Conflict of Laws. A study of the special problems that arise when the significant facts of a case are connected with more than one jurisdiction, including rec-

ognition and effect of foreign judgments, choice of law, federal courts and conflict of laws, and the United States Constitution and conflict of laws. 3 s.h. fall. *Reppy*

315. Corporate Finance. A consideration of the role and impact of financial analysis in the application and development of legal norms in connection with recurring corporate transactions. Coverage includes an investigation of the financial considerations arising in connection with valuation of a business corporation, rearrangement of the rights of creditors and stockholders in bankruptcy, establishment of dividend and reinvestment policies of publicly traded corporations, and measurement of the fairness and success of corporate acquisitions. The concluding half of the course is devoted to discussion of various financial alternatives to effecting acquisitions which shall be explored in a series of brief memoranda prepared by the students for formal discussion and evaluation in class. Prerequisite: Business Associations. 2 s.h. spring. *Gordon*

320. Corporate Taxation. A study of the special provisions of the Internal Revenue Code concerning the tax effects of the major events that occur in the life span of a corporation, including the taxation of distributions of corporate property to shareholders and the formation, reorganization, and liquidation of corporations. Prerequisite: Basic Federal Income Taxation. 3 s.h. fall. *Gann*

223. Criminal Procedure: Formal. A study of the basic rules of criminal procedure, beginning with the institution of formal proceedings, with special emphasis upon bail, criminal discovery, plea bargaining, prosecutorial discretion, preliminary hearings, the grand jury, professional ethics in criminal cases, speedy trial, and sentencing. 2 s.h. fall. *Everett*

223. Criminal Procedure: Formal. A study of the basic rules of criminal procedure, beginning with the institution of formal proceedings. Subjects to be covered include prosecutorial discretion, the grand jury, the preliminary hearing, criminal discovery, guilty pleas and plea bargaining, jury selection, pretrial publicity, double jeopardy, the right to counsel and professional ethics in criminal cases. 3 s.h. fall. *Beale*

222. Criminal Procedure: Police. A study of the legal restrictions on police investigative practice which typically proceeds the institution of formal proceedings, with special emphasis upon "stop and frisk," arrest, search and seizure, confession suppression, lineups, electronic surveillance, and operation of the exclusionary rule. 2 s.h. fall, *Everett*; or 2 s.h. spring. *Pye*

325. Debtors' Estates. A study of the methods by which conflicts between the financially distressed debtor and creditors, and conflicts among creditors may be resolved. Considered and comparatively evaluated are remedies invoked by both the debtor and a creditor or creditors, those looking to both debtor liquidation and debtor rehabilitation, and those both without and within the Bankruptcy Code. Prerequisite: Commercial Law or Secured Transactions or permission of the instructor. 3 s.h. fall. (Not offered 1983-84.)

325. Debtor-Creditor Law. A study of the methods by which conflicts between and among financially distressed debtors and creditors may be resolved. To this end, attention is focused on the creation and enforcement of security interests in personal property, debt-collection procedures, and remedies looking to either debtor liquidation or debtor rehabilitation, both without and within the Bankruptcy Code. Students who have already taken either Secured Transactions or Commercial Law will be excused from the first four weeks of the course (in which Article 9 of the Uniform Commercial Code is explored). 4 s.h. or 3 s.h. (for those who have already taken either Secured Transactions or Commercial Law) fall. *M. Shimm*

359. Economic Analysis of Legal Issues. An exploration of diverse topics in law and economics such as property rights and externalities, tort law and optimal accident prevention, bargaining and game theory, the economics of contracts, and theories of economic justice. 2 s.h. (Not offered 1983-84.)

517. Employment Discrimination. A study of the law of employment discrimination, focusing mainly on federal law prohibiting race, sex, age, and handicapped discrimination. The course provides a basic knowledge of statutory coverage, standards, procedures and proof, and avenues of relief. Class discussion emphasizes important issues arising in current cases: for example, reverse discrimination versus affirmative action, the controversial "comparable worth" concept in equal pay litigation, and the "bottom line" defense to test invalidation. 2 s.h. fall. *L. Larson*

326. Entertainment Law I. An introduction to selected theories, statutes, and regulations (other than intellectual property law) governing principal undertakings, business transactions, and legal relationships in the entertainment industry, including publishing, the theater, television and motion pictures, music, and related fields. 2 s.h. (Normally offered in alternate years. Not offered 1983-84. Requires concurrent or prior enrollment in Intellectual Property I and II.)

327. Environmental Law. A study of major policy and legal issues raised by efforts to manage environmental harms and pressure ecological systems. Emphasis in the course is on recurring themes and conflicts, and on the economic, social, ecological, and political assumptions that underlie the different responses that have been proposed. 3 s.h. spring. *Schroeder*

330. Estate and Gift Taxation. A study of the rules governing federal taxation of gifts, trusts, and estates, including selected federal income tax laws relating to trusts. Prerequisite: Basic Federal Income Taxation (may be taken concurrently). 3 s.h. fall. *Adams*

225. Evidence. A study of the theory and rules governing the presentation of evidence to a judicial tribunal, including the function of the judge and jury; the concept of relevancy; character evidence; judicial notice; real and demonstrative evidence; authentication of writings; the best evidence rule; competency, impeachment, and rehabilitation of witnesses; hearsay and the exceptions to its exclusion; and privileged communications. 3 s.h. fall, *Pye*; or 3 s.h. spring. *Mosteller*

335. Family Law. A study of legal issues relating to the family, including marriage, unmarried cohabitation, divorce, procreation and abortion, child custody, and the relationship between parent, child, and state. 3 s.h. spring. *Bartlett*

340. Federal Courts. A study of the federal courts with respect to the part played by them in achieving a workable federalism. Special attention is given to the original jurisdiction of the federal district courts, the relationship of the federal courts to state courts and state law, and the permissible and desirable range of federal judicial power. 3 s.h. spring. *Reppy*

397. Federal Tax Policy. Structure, incidence, and economic effects of major federal taxes. Special attention to problems of inflation, income definition, and distortions of economic incentives in the areas of savings and investment. There are no fixed prerequisites, but prior or concurrent exposure to other tax courses (especially Basic Federal Income Taxation) and/or microeconomics and statistics courses would be helpful. Up to ten students may elect, with instructor's permission, to enroll in Independent Research for one additional semester hour. 2 s.h. spring. *Schmalbeck*

250. Financial Information, Accounting, and the Law. An examination of the significance of financial information to two important groups: investors and creditors. This objective is sought through an examination and analysis of accounting principles

and practices as they interface with a variety of legal problems. The course materials also present a wealth of information arising from empirical studies of stock price behavior in response to financial information as further evidence of the information needs of investors. Contemporary reporting problems such as the regulation of financial forecasts, accounting for the gains and losses arising from inflation, the role of financial information in predicting business failure, and the information needs of investors in an efficient market are singled out for special consideration, along with the more orthodox coverage of the fundamentals of accounting theory and practice. 2 s.h. spring. *Croft*

265. Future Interests. An examination of the following considerations in non-commercial property dispositions: class gifts and other issues in will construction; powers of appointment; classification of future interests; and rules against perpetuities, accumulations, and restraints on alienation. 3 s.h. spring. *Sparks*

337. Institutional Investors. An examination of the behavior and responsibilities of mutual funds, life insurance companies, pension funds, bank trust departments, charitable foundations, and other institutional investors. Questions to be examined are the obligations institutional investors owe to their beneficiaries, the companies in which they invest, and to society generally. Of equal concern are the economic considerations that guide the investment behavior of institutional investors and underlie their regulation. Prerequisite: Business Associations. 2 s.h. (Not offered 1983-84.)

229. Insurance Law. An examination of the nature of insurance and the insurance contract. Possible topics include: the role of risk classification, marketing, the principle of indemnity and the notion of an insurable interest, subrogation, the risks transferred, rights at variance with policy provisions, claims processes, and justifications for and the nature of regulation of insurance institutions. 2 s.h. fall. *Bernstein*

357. Intellectual Property I: Law and the Arts. An introduction to the principal theories of intellectual property in the fine arts and in the entertainment and sports industries. Includes comprehensive instruction in copyright, unfair competition, and the right of publicity, as well as selective coverage of other doctrines. 2 s.h. (Normally offered in alternate years. Not offered 1983-84.)

367. Intellectual Property II: Business Intellectual Property. An introduction to trademark and patent law licensing and the law of trade secrets, as well as selective coverage of other subjects in conventional business and industrial settings. 1 s.h. (Normally offered in alternate years. Not offered 1983-84. Requires concurrent enrollment in Intellectual Property I.)

345. International Business Transactions. This course examines various topics related to the conduct of international business. Subjects covered are international private trade, including private international contracts, dispute resolution, and letters of credit; the extraterritorial reach of the antitrust and securities laws; national and international regulation of trade in goods, including GATT; and international regulation of monetary affairs through the IMF. 2 s.h. spring. *Gordon*

230. International Law. An introduction to the public international law of peace, including the nature and sources of international law; its place in national and international decision making; the roles of international organizations, states, and individuals in the international legal system; bases and limitations of jurisdiction; the utilization and interpretation of treaties and other international agreements; and some aspects of the regulation of economic activity within the international system. 3 s.h. fall. *Robertson*

232. International Organizations. An examination of the legal issues involved in the structure, functions, and operations of the United Nations and other international organizations within the international system. 2 s.h. fall. *Robertson*

235. Jurisprudence. A historical examination of the development of legal philosophy from ancient times to the contemporary period. 3 s.h. fall. *G. Christie*

240. Labor Relations. A study of the law of labor-management relations, centering upon the National Labor Relations Act, as amended. The course investigates problems involved in the regulation of industrial conflict (strikes, picketing, boycotts, and unfair labor practices by employers), the establishment of the collective bargaining relationship, the negotiation and enforcement of the collective agreement, the arbitration of disputes under the agreement, the relationship between the union and its members, and the protection of individual and minority rights. 3 s.h. fall. *Horowitz*

217. Negotiable Instruments. A study of the law governing negotiable instruments—checks, drafts, and promissory notes—emphasizing Articles 3 and 4 of the Uniform Commercial Code. Topics that are given particular attention include the function and incidents of negotiable instruments, the treatment of events that frustrate their payment, and bank collections. 2 s.h. spring. *M. Shimm*

396. Oil and Gas. A study of the law governing the recognition and protection of property interests in oil and gas in natural reservoirs and an analysis of the transactions, particularly the oil and gas lease, by which the right to produce oil and gas is purchased. Although the course is focused on the private law problems of landowners and firms interested in mineral development, the legal problems and policy implications of government intervention for conservation and for economic regulation are considered. 3 s.h. spring. *Maxwell*

333. Psychiatry for Lawyers. This course will examine development of personality, both normal and pathological, from a psychoanalytic point of view, with particular emphasis on those aspects that affect legal practice. 2 s.h. fall. *C. Shimm and M. Shimm*

339. Public Education Law. An examination of public education from two perspectives: (1) the institutional and legal framework—organization, financing, and governance of public schools and their relationship to other governmental bodies; and (2) the perspective of the individual student on education and the educational system—due process, equal educational opportunity, religion in schools, testing and ability grouping. 2 s.h. (Not offered 1983-84.)

365. Real Estate Financing. An examination of techniques of real estate financing, including conventional mortgages, subdivision development, and federal assistance to real estate developers. Prerequisite: Commercial Law or Negotiable Instruments. 3 s.h. spring. *Maxwell*

370. Regulated Industries. A study of government economic regulation in such regulated industries as transportation, electric power, telephone, broadcasting, oil and gas, and health care, with emphasis on control of entry, mergers, and rates, and on the interface between regulation and the antitrust laws. 3 s.h. (Not offered 1983-84.)

332. Remedies. A survey of the law of judicial remedies, with illustrative applications in various areas of substantive law. Approximately half the course is spent on aspects of the main types of remedies—damages, equitable remedies, restitution, and declaratory relief. The remainder examines applications in principal substantive law fields—private law (injury to persons and personal property, real property, and contract) and public law (civil rights). Class discussion is not primarily of cases but

rather of problems, related to reading assignments in a text rather than a casebook. 2 s.h. (Not offered 1983-84.)

373. Secured Transactions. A study of the law governing the financing of personal property transactions on a secured basis, emphasizing Article 9 of the Uniform Commercial Code. Particular attention is given to the creation and perfection of security interests, the rights of third parties who may claim competing interests in the goods, and the consequences of default. 2 s.h. (Not offered 1983-84.)

375. Securities Regulation. A study of the federal and state securities laws and the industry they govern with emphasis on the regulation of the distribution process and trading in securities; subjects dealt with include the functions of the Securities and Exchange Commission, registration and disclosure requirements and related civil liabilities, "blue-sky" laws, proxy solicitation and reporting requirements, broker-dealer regulation, the self-regulatory functions of the exchanges, and the regulation of investment companies. Prerequisite: Business Associations. 3 s.h. fall. Cox

390. State and Local Government. An examination of the scope of local government power, intergovernmental relations, legislation by local government, enforcement of regulatory measures, labor-management relations in public employment, financing local government, public expenditures, urban renewal, housing and code enforcement, eminent domain, and governmental tort liability. 2 s.h. (Not offered 1983-84.)

270. Trusts and Wills. An examination of noncommercial property dispositions, both testamentary and *inter vivos*, including the following topics: the estate system, intestate succession, execution and revocation of wills, creation of trusts, ademption and lapse, integration of dispositive schemes, charitable trusts, resulting and constructive trusts, remedies for wrongful interference with succession and transfer, and problems in trust administration. 3 s.h. fall, *Croft*; or 3 s.h. spring. *Sparks*

CLINICAL COURSES AND SEMINARS

Clinical courses and seminars engage students in the work of practicing lawyers. Enrollment in each such offering is limited.

615. Clinical Tutorials In Advanced Entertainment, Sports, and Communications Law. Clinical practicums offering selected problems derived from the current practice of entertainment, sports, and communications law. 2 s.h. (Enrollment limited; instructor's permission required [not lotteried]. Available when announced; normally offered in the year following Entertainment or Communications Law I or Athletics and the Legal Process. Not offered 1983-84. Requires prior [or concurrent] enrollment in the relevant courses.)

380. Civil and Criminal Trial Practice. An introduction to the civil and criminal litigation process and attendant skills. The course emphasizes the interactions between attorneys and their clients and between lawyers and juries by use of simulation and videotape pedagogy. Areas of inquiry include trial preparation, jury selection, opening statements, closing arguments, evidentiary objections, and direct- and cross-examination. Each student completes the course requirements by participating as counsel in a full jury trial. Prerequisite: Evidence. 3 s.h. fall, *Hutchinson, Mosteller, or Swinson*; 3 s.h. spring. *Becton, Beskind, or Swinson*

538. Clinical Seminar in Civil Litigation Practice. An intensive practicum in pretrial litigation, combining a two-hour classroom component requiring the student to "litigate" a simulated case through the stages of interviewing and fact investigation, pleadings, discovery, negotiation, and with an extramural placement in a local law office requiring the student to perform litigation tasks on actual cases. Placements

will be in legal services offices or in private law firms. Under the North Carolina Student Practice Rules, this placement experience may include actual representation of indigent clients. 4 s.h. (Not offered 1983-84.)

554. Clinical Seminar in Commercial Arbitration. A concentrated, lecture presentation of the fundamentals of construction law (2 hours per week for 3 weeks), followed by the students' preparation (4 weeks) and presentation (3 hours per day for four days in each of two weeks) of a construction arbitration. Two teams of up to six members each utilize the project documents and transcript of a recent case to develop practical skills in formulating the theory of the case, preparing the claims/defense manuals, demonstrative evidence and briefs, examining and cross-examining witnesses, and making opening and closing arguments. Three students act as arbitrators, conduct the hearings, rule on evidentiary matters, and render a written award. There is a "morning after" critique of each session. 3 s.h. spring. *Foster*

569. Clinical Seminar in Commercial Practice. A study of the professional tasks involved in the resolution of commercial disputes. Students are divided into small simulated law firms, each working under the supervision of a senior fellow who is a partner in a major law firm. Each firm receives a portfolio of problems to be handled throughout the year. The assigned tasks for each problem include legal analysis of the client's position, advice to the client, settlement negotiations with adversary counsel, preparation of briefs, and oral argument before a judge. The problems are prepared, and the work of the student firms largely evaluated, by external examiners who are associates in other major law firms. A faculty member serves as a second partner in each firm to assist the senior fellow and students with organizational matters. Enrollment is limited to thirty-six students and is subject to approval of the course administrator. Preference will be given to students who do not have substantial outside time commitments. 2 s.h. fall and spring. *Hutchinson and staff*

521. Clinical Seminar in Criminal Litigation. An examination of the lawyering process in criminal cases from the point of view of the criminal justice practitioner. Using videotape simulation, students will participate as attorneys in simulations of various stages of criminal justice process from initial interview through trial. The clinical phase of the seminar requires each student to practice with criminal justice practitioners pursuant to the North Carolina Rules Governing Practical Training of Law Students. Placements include district attorneys and private defense counsel. Prerequisites: Criminal Procedure: Police: Evidence: and Trial Practice. 4 s.h. fall. *Beskind and Rudolf*

568. Clinical Seminar: Federal Courts and the Appellate Process. A study of select problems and issues concerning the appellate process in the federal court system. The course is designed to provide an applied research and writing experience, in addition to in-class lectures and discussions. The class will cover a number of related topics, focusing principally on the work of the United States Courts of Appeal and (to a lesser degree) the United States Supreme Court. Substantive coverage will include: "jurisdictional" issues of particular interest at the appellate level, final orders and interlocutory appeals, "standing" and "ripeness" issues, prudential considerations militating against appellate review, waiver of appealable issues, the proper scope and standard of review (with emphasis on administrative agency appeals), and the remedial authority of the courts. In addition, the course will deal with certain practical problems of advocacy and judicial administration (such as: when and what to appeal, preparation of appellate briefs, oral advocacy, dispute settlement techniques, decision-making processes, and special institutional problems facing appellate judges). There will be no final examination; however, students will be required to complete one or more written assignments (such as an appellate brief, or a draft opinion, or a paper of limited length dealing with some important aspect of the

federal appellate process). Students will also likely engage in at least one oral presentation. Prerequisite: Constitutional Law; Administrative Law is recommended. Enrollment limited to sixteen students. 3 s.h. fall. *Edwards*

568. Clinical Seminar: Federal Courts and the Appellate Process. A study of select problems and issues concerning the appellate process in the federal court system. The course is designed to provide an applied research and writing experience, in addition to in-class lectures and discussions. 3 s.h. spring. *Phillips and Rutledge.*

558. Clinical Seminar in Habeas Corpus and Criminal Appeals. Preparation of briefs in a habeas corpus case scheduled for argument in the United States Court of Appeals, Fourth Circuit; placements for work on one or more criminal appeals in state or federal court with North Carolina Department of Justice or North Carolina Appellate Defenders. Enrollment limited to eight students. 2-3 s.h. spring. *Reppy*

574. Clinical Seminar in Land Titles. Title searching under traditional and computerized methods in two area county offices. Preparation of title documents for closing of real estate acquisition. Meetings with land title company officials and local real estate practitioners. Enrollment limited to twelve students. 1 s.h. (pass/fail) fall. *Reppy*

544. Clinical Seminar in Land Use Planning. In-depth study of select North Carolina cities to determine the impact of various legal issues in land use planning on North Carolina communities, including: the "taking issue"—section 1983; the Central Business District and the Sherman Act; the impact of changing demography in the last thirty years on local zoning policies; the acceptance or rejection of the halfway house; and the attitude of communities toward "time sharing." 3 s.h. spring. *Babcock*

506. Clinical Seminar in Negotiation and Settlement. An examination of the lawyer's role as a negotiator in seeking to resolve legal disputes without resort to full adjudication. The course focuses on techniques, tactics, ethics, and other aspects of the negotiation process. Students are divided into teams which compete with each other in seeking to negotiate settlements in a series of simulated disputes involving such matters as commercial transactions, personal injury claims, real estate transactions, antitrust litigation, and labor relations. Enrollment limited to twenty-four. 2 s.h. spring. *Hutchinson.*

536. Clinical Seminar: Representing the Child. A study of practical and ethical considerations involved in representing children, requiring the student to respond as a lawyer to simulated problems in child advocacy. Course includes the lawyering processes of interviewing, counseling, negotiation, case planning, and trial practice. The class problems, which deal with the child's relationship both to his or her parents and to the state, include delinquency, child abuse and neglect, child custody, the handicapped child in public schools, the institutionalized child, and health care. To supplement the simulation assignments, all students will be required to perform lawyering tasks in connection to an actual case on which they will work with either the instructor or a local attorney. An additional one-hour credit may be earned by more extensive casework with a local attorney who represents children. Prerequisite: Family Law. 3 s.h. spring. *Bartlett*

OTHER SEMINARS

The following seminars are offered on a limited enrollment basis.

508. Seminar in Agency, Partnership, and the Employment Relation. A traditional examination of the law of agency and partnership coupled with the study of

certain specialized problems arising from the employment relation such as the termination of employees and the enforceability of postassociational restraints on competition. 2 s.h. (Not offered 1983-84.)

290. Seminar in American Law and Legal Research for International Students.

This course consists of two components conducted simultaneously. The first is a series of lectures by members of the Law School faculty on various aspects of the legal system of the United States and may include required readings. The second is in the form of a research and writing tutorial designed to introduce international students to the techniques of case and statutory analysis as well as the tools and methods of legal research. Students are expected to complete written assignments and memoranda of law. 2 s.h. fall. *Germain and Robertson*

577. Seminar in Antitrust and the Professions. An examination of the impact of the recent extension of antitrust laws to "the learned professions." In addition to considering the significance of these developments for professionalism, special antitrust issues are also addressed. (Not offered 1983-84.)

579. Seminar in Bankruptcy Reorganization. This seminar will examine the reorganization of financially distressed debtors under chapter 11 of the Bankruptcy Code. 2 s.h. spring. *M. Shimm*

513. Seminar in Chinese Law and Society. A survey of the evolution of Chinese legal thought and practice from its origins to contemporary development, with an emphasis on an examination of the law of late imperial eighteenth to early twentieth centuries, and People's China. Particular attention is focused on the relation of law to social ideals, to social change, and to politics. In addition to conventional criminal and civil processes, the informal and extrajudicial institutions, procedures, and norms that have been employed in China are also studied. Readings include "legal novels," and translations of laws, cases, and jurisprudential essays from both traditional and contemporary China. Prior familiarity with Chinese history is unnecessary. 2 s.h. fall. *Ocko*

584. Seminar in Collective Bargaining. A comprehensive treatment of the legal and practical aspects of negotiating a collective bargaining agreement in both the public and private sectors. There is substantial student participation, together with practical demonstrations relating to arbitrations and typical bargaining problems. Prerequisite: Labor Law. 2 s.h. fall. *Siegel*

503. Seminar in Communications Law and Policy. An examination of the following areas: First Amendment theory and development; regulation of the media as businesses; the right to gather information; proposed rights of access to the press; defamation and invasions of privacy; copyright; the regulation of obscenity and indecent matter; and the special regulatory position of the electronic mass media under the Communications Act of 1934, with particular emphasis on license applications and renewals, cross-ownership and control, network practices, programming, and cable and pay television. 2 s.h. (Not offered 1983-84.)

559. Community Property. A survey of the marital property laws of Arizona, California, Idaho, Louisiana, Nevada, New Mexico, Texas, and Washington, with comparison to Spanish system. Students may concentrate their studies on the law of one of the eight states. 2 s.h. (Not offered 1983-84.)

582. Seminar in Comparative Law: Western and Socialist Traditions. Comparative law often concentrates exclusively on civil law, overlooking both that our perception of the common law is very limited to how the common law developed in only one nation, and that another major Western legal tradition has formed—socialist law. The course will consider, for each of these root traditions, the history, culture,

and distribution of the law; legal institutions; legal actors; procedure and sources and rules of law. 2 s.h. spring. *Gordon*

572. Seminar on Comparative Public Law and Policy: Ethnic Group Relations. An interdisciplinary seminar to appraise various approaches to the reduction of conflict in deeply-divided societies, primarily in Asia and Africa, but with secondary attention to Western countries. Substantial attention will be paid first to the nature of ethnic identity, the sources of group conflict, and the forms and patterns it takes. Consideration will be given to methods of analyzing social science materials and utilizing them for the design of policies, laws, and institutions. Approaches considered include federalism, regional autonomy, electoral law, parliamentary and presidential arrangements, and programs to prefer under-represented ethnic groups in education, employment, and other spheres of economic activity. Emphasis will be placed on forecasting and evaluating the impact of alternative approaches. 2 s.h. fall. *Horowitz*

550. Seminar in Constitutional History. Supervised research on the eighteenth-century formation of the federal Constitution. 2 s.h. fall. *Dellinger*

625. Seminar in Constitutional Law—Theories of Constitutional Adjudication. An examination of the role of the Supreme Court and methods of deciding constitutional issues, beginning with such topics as the relevance of constitutional history, legislative and administrative motive, legislative facts, and interest balancing; continuing with study of constitutional doctrines in major areas such as procedural and substantive due process, equal protection, fundamental rights, and freedom of expression, with emphasis on how ideas of what role the Court should properly play affect the doctrines themselves; and concluding with consideration of current constitutional cases raising issues discussed earlier in the seminar. There will be a writing requirement, with an individual option for an examination in lieu of part of the writing requirement. Prerequisites: completion of a basic course in constitutional law, and a (reasonably) serious interest in confronting difficult and often rather theoretical questions of the role the Supreme Court should play in American government. 2 s.h. (Not offered 1983-84.)

585. Seminar in Construction Law. An interdisciplinary approach to the engineering (design), business, and legal aspects of construction problems, with students from both the engineering and business schools. The seminar participants are divided into teams who consider problem cases, develop theories of presentation and evidentiary support, and present the result in class. The seminar culminates in a twenty-page paper which applies the skills developed to a particular problem. 2 s.h. fall. *Foster*

576. Seminar in Corporate Governance. An examination of the public corporation's structure, focusing upon the question whether changes in that structure can be expected to make corporate managers more responsive to socially desirable objectives. Course materials will be the most recently issued draft of the proposals to the American Law Institute on corporate governance and structure. Close examination will be given to the monitoring model for director behavior against selected case studies; the difficulties and debate surrounding prescribing a monitoring model through statutory enactments; the dissonance between the monitoring model and existing fiduciary standards; conflicts between the compensatory and deterrent functions of the derivative suit; and the problems posed by derivative suit litigation. A paper and class presentation will determine at least 60 percent of each student's grade. 2 s.h. spring. *Cox*

580. Seminar on Corporations: Advanced Problems. An examination of selected topics in the regulation of business associations under state corporation statutes and

the Securities Exchange Act of 1934. A comparative perspective will be used for some topics. Topics that the seminar may explore include, among others, the regulation of tender offers, controls on insider trading, and problems raised by derivative litigation. A paper is required. Prerequisite: Business Associations. 2 s.h. fall. *DeMott*

515. Seminar in Estate Planning. An examination of the problems and techniques of estate planning and administration, including the income taxation of trusts and estates. Students prepare planning recommendations and draft related documents for hypothetical clients. Prerequisites: Estate and Gift Taxation and Trusts and Wills; students taking Future Interests as well will be given preference in enrollment. 3 s.h. spring. *Adams*

500. Seminar in the Federal Practice of Civil Rights and Civil Liberties. A study of advanced constitutional law and federal practice, working through a series of problems to provide: (a) familiarity with the principal federal statutes (procedural, substantive, and remedial) used in civil rights litigation; (b) their judicial interpretation and application; and (c) a consideration of frontier constitutional issues. 3 s.h. spring. *Van Alstyne*

518. Seminar in Federal Tax Policy. Structure, incidence and economic effects of major federal taxes. Special attention to problems of inflation, income definition, and distortions of economic incentives in the areas of savings and investment. There are no fixed prerequisites, but prior or concurrent exposure to other tax courses (especially Basic Federal Income Taxation) and/or microeconomics and statistics courses would be helpful. 3 s.h. (Not offered 1983-84.)

561. Seminar in Forensic Psychiatry. This course is designed to provide the student with a working knowledge of the major areas of interface between psychiatry and law. Basic concepts of clinical psychiatry and psychopathology will be explored. The commitment process, right to treatment and right to refuse treatment, competency to stand trial, criminal responsibility, the role of the psychiatric expert and psychological testing will be discussed. Discussion of assigned readings, patient interviews, observation of patients involved in legal proceedings, films, and input from guest speakers will form the basis of the course. 2 s.h. spring. *Brodie and Johnson*

548. Seminar in Health and Safety in the Chemical Industry. A study of the policy and legal issues that are suspiciously raised by the toxic chemicals and the characteristics and uses of public health problems they pose. The implications of imperfect scientific knowledge, low probabilities of highly catastrophic events, and remote consequences will receive attention. The seminar will include presentation of some of the instructor's work in this area as well as of student papers. Completion of either administrative law or environmental law will be extremely valuable and may be a criterion for enrollment in the event of oversubscription. 2 s.h. fall. *Schroeder*

578. Seminar in Problems in International Transactions. This course is designed to provide lawyers with a general context within which to analyze legal problems of doing business abroad. Opening sessions will deal with theoretical considerations and institutions important in the international legal system. A series of case studies thereafter will consider those aspects of United States law that bear on international transactions as well as typical problems presented by the interaction of foreign legal systems with our own. 2 s.h. spring. *McDonald*

557. Seminar in International Taxation. An examination of the federal income tax imposed on income earned in foreign countries either by citizens and residents of the United States or by foreign corporations that are controlled by citizens and residents of the United States. The course also includes a study of the federal income tax imposed on nonresident aliens and foreign corporations on their income derived from United States sources. Prerequisites: Personal Income Taxation, Corporate Tax-

ation (may be taken concurrently), or permission of the instructor. 2 s.h. (Not offered 1983-84.)

366. Seminar on Jewish Law. Study of factors (cultural and juristic) in the development of Jewish law especially in the Talmudic and mediaeval periods; relationship between "religious" and "civil" law; the legal codes and the decision-making process of the rabbinic courts. Some legal texts (in translation) will be submitted to intensive examination. 2 s.h. fall. *Golding*

534. Seminar on Judicial Administration and Politics. Examination of the judicial function in relation to historical and contemporary politics of court organization, administration, and procedures as well as of selection and discipline. Focus is on American federal judicial system with references to state and comparative aspects of the adjudication-politics relationship. 2 s.h. spring. *Fish*

526. Seminar on Judicial Biography. The seminar is devoted to the study of biography as a form of legal history. Biographies of judges will be assigned for reading and discussion. In addition to a critical evaluation of the biographies, the seminar will consider the problems inherent in writing biography, the goals of an author of a judicial biography, and the constraints that may be placed on an author. A paper is required. 2 s.h. (Not offered 1983-84.)

566. Seminar in Jurisprudence. An intensive inquiry into specific problems of modern jurisprudential theory. 2 s.h. (Not offered 1983-84.)

620. Seminar in Law of the Sea. An examination of the legal problems resulting from uses of the seas and the efforts made toward resolution of those problems. The seminar's focus is on the jurisdictional problems created by the competing claims of nation-states to competence as to the territorial sea, the continental shelf, the contiguous zone, economic zones, and the seabed. These claims are examined in the context of specific uses of the seas, including navigation, military, fishing, extraction of minerals, and scientific research. Prerequisite: International Law (may be taken concurrently). 2 s.h. (Not offered 1983-84.)

528. Seminar in Legal Issues in Health Care. A study of the health care delivery system and the legal problems it presents. The seminar will direct attention to licensing and other controls over physicians and other health personnel, the law of medical malpractice and other mechanisms for assuring the quality of care, regulatory mechanisms to contain costs, some antitrust issues, and proposals for national health insurance or other fundamental reform. 2 s.h. spring. *Havighurst*

586. Seminar on the Legal Profession. This seminar will deal with the development and present character of the American lawyer's social role. Some of the topics the readings will address include: the historical evolution of the American lawyer; the role of the lawyer in effecting political changes; and the relationship, if any, between the lawyer's code of conduct and our traditional notions of ethical behavior. Requirements: class participation, one research paper. 2 s.h. spring. *Mirande*

527. Interdisciplinary Seminar in Medical-Legal-Ethical Issues. A seminar composed of students and faculty from the Medical, Law, and Divinity Schools for critical consideration of selected pertinent issues of mutual professional interest. 2 s.h. spring. *Gianturco (medicine), M. Shimm (law), and Smith (divinity)*

570. Seminar in Military Law. A study of military jurisdiction, the rights of military personnel, and the body of both substantive and procedural law that has developed under the Uniform Code of Military Justice. In addition to its other goals, the seminar seeks to develop skills in statutory interpretation and to encourage comparisons between civilian and military criminal law administration. 2 s.h. (Not offered 1983-84.)

573. Seminar in Race Discrimination Law. This course reviews the history of race discrimination in the United States and investigates the use of law in either maintaining or combatting race discrimination in public facilities, voting rights, public education, and housing. Each student will be required to write a paper and present an oral argument. 2 s.h. spring. *Ainsworth*

556. Seminar in Responsibility in Law and Morals. Investigation of the relationship between responsibility in the law and moral blameworthiness; excuses and defenses; the roles of such concepts as act, intention, motive, ignorance, and causation. Texts: Holmes, *The Common Law*; Hart, *Punishment and Responsibility*; Morris, *Freedom and Responsibility*. 2 s.h. (Not offered 1983-84.)

581. Seminar in Taxation of Exempt Organizations. An examination of the role and status of nonprofit corporations with the focus on federal tax rules that apply to organizations exempt from federal income taxation. Emphasis is placed on 501(c)(3) public charities, but consideration is also given to the role and treatment of private foundations. Consideration is given to the policy and practice of preferred tax treatment for selected organizations, including tests for qualification, denial or loss of exemption, mechanics for securing and retaining exemption, reporting requirements, unrelated business income, private inurement and political activity. Prerequisite: Basic Federal Income Taxation. 2 s.h. (Not offered 1983-84.)

629. Seminar on Water Law. The course will examine issues of water acquisition, allocation, and transfer, including analysis of both riparian and prior appropriation systems of water rights as well as developing systems of administrative supervision of these issues. Problems of federal water rights, interstate disputes over water allocation, and some of the aspects of the relationship between water quality and water quantity will also be explored. 2 s.h. spring. *Schroeder*

RESEARCH TUTORIALS

Research Tutorials emphasize individual research and writing in an area of current research by the supervising faculty member. Typically, such tutorials are offered only once. Those offered in 1983-84 are listed below.

567. Research Tutorial/American Legal History. Students enrolling in this tutorial will be expected to write a paper about some aspect of the history of American law, either public or private, during the years between the end of Reconstruction and the end of the First World War. Permission of the instructor is required to enroll. 3-6 s.h. fall through spring. *Pratt*

611. Research Tutorial/Discretion. An examination of the philosophical implication of the notion of discretion as it applies in the law. Limited to three students. 3-6 s.h. spring. *G. Christie*

543. Research Tutorial/Federal Taxation of Life Insurance Companies and Products. Students will prepare papers covering selected issues arising under subchapter L of the Internal Revenue Code (taxation of insurance companies) or under other provisions of the Code (e.g., sections 72, 79, 101) that govern the taxation of income generated by the various products sold by life insurance companies. 3-6 s.h. fall. *Schmalbeck*

546. Research Tutorial/Grand Jury Practice. Students will prepare major research papers on topics relating to federal and state grand jury practice. The grand jury is especially effective in investigating white collar crime, organized crime, and official corruption. Increased reliance on the grand jury for these purposes has led to an explosion of litigation challenging various aspects of grand jury practice. Papers may focus on some aspect of the rights of witnesses called before the grand jury (including

the privilege against self-incrimination, the attorney-client privilege, and the right to counsel), the use and abuse of the grand jury's subpoena power, the role of the prosecutor in grand jury proceedings, or the limitations on judicial review of grand jury proceedings. 2 to 6 s.h. fall through spring. *Beale*

590. Research Tutorial/International Taxation. Supervised research and writing on topics concerning the United States income taxation of nonresident aliens and foreign corporations on their income derived from United States sources. Part of the research includes an analysis of the American Law Institute's Federal Income Tax Project, Tentative Draft No. 10, United States Taxation of Foreign Persons. United States income tax treaties will also be analyzed, particularly the antitax haven and sharing of information provisions. Basic Federal Income Taxation is a prerequisite. 2-4 s.h. spring. *Gann*

511. Research Tutorial/Law and Education of Children with Special Needs. Supervised research on matters of law and policy relating to the education of children who have physical, mental, and other learning disabilities or gifts that make public education designed for "normal" children, ineffective as to them. Special attention will be given to the response of the law to the reduction in resources available to public schools. Some tutorial members may assist in the evaluation and editing of solicited articles from outside authors on this topic, for a symposium issue of *Law and Contemporary Problems*. 2 to 6 s.h. fall or fall through spring. *Bartlett*

INDEPENDENT RESEARCH

Law students in their second and third year of the J.D. or LL.B. programs may undertake up to four semester-hours of independent research in any academic year if the research is approved by a faculty member. Research will be graded on a credit/fail basis. Students undertaking independent research will meet regularly with the faculty member supervising the research in order to ensure contemporaneous discussion, review, and evaluation of the research experience.

AD HOC SEMINARS

A group of five or more students may plan and conduct their own research and seminar program for not more than two semester-hours of credit (which shall be considered to be independent research within the meaning of the maximum limitation of four semester-hours of independent research each year). A request to establish such an ad hoc seminar should be addressed to the Dean at least two months before the end of the semester preceding the semester in which the seminar is proposed and contain an outline of coverage and required readings. The Dean will request a member of the faculty to evaluate the program and determine whether the proposed program has academic merit. If approved by the Dean, a faculty member will be requested to evaluate the contribution of each participant before awarding credit. A written paper of the kind generally submitted in seminars will be required of each participant. Such seminar work shall be graded on a credit/fail basis.

COURSES IN OTHER DIVISIONS OF THE UNIVERSITY

Second- and third-year students may take courses offered in other divisions of the University upon the condition that the student is engaged simultaneously in at least ten semester-hours of courses in the Law School. Credit (limited to a total of six semester-hours) toward the J.D. degree will be granted for courses of suitable academic rigor. A written request for permission to enroll in a University course outside the Law School must be presented to the Assistant Dean for Student Affairs. A grade of P (or its equivalent) or better will be recorded as *credit*. Grades that are lower than P but higher than F (or their equivalents) will be recorded as *no credit*. Failing grades will be recorded as *fail*.

Degree Programs



Juris Doctor Degree

Upon favorable recommendation of the faculty, the degree of Doctor of Law (J.D.) will be conferred upon students who have successfully completed six semesters of law study in residence at Duke. Two semesters of law study undertaken at another accredited American law school may be counted toward the required total if the final two semesters (exclusive of a summer session) and a minimum of fifty-five semester-hours of law study are undertaken at Duke.

Students shall be deemed successfully to have completed six semesters of law study if, during a minimum of ninety academic weeks, they have satisfied the following requirements:

1. a passing grade in courses aggregating eighty-six semester-hours and
2. a grade-point average of at least 1.80 on a 4.0 scale and status in good standing under the rules of the Law School.

Bachelor of Laws Degree

Upon favorable recommendation of the faculty, the degree of Bachelor of Laws (LL.B.) will be conferred upon students who have satisfied all of the requirements listed above as necessary for the Doctor of Law degree but who do not possess a baccalaureate degree prior to completion of the program of study for the Doctor of Law degree.

Joint Degrees

Combined Doctor of Medicine-Law Degree. The School of Law and the School of Medicine of Duke University jointly sponsor a program of combined legal and medical education. The program provides an opportunity to acquire a full basic study of the two fields. Upon satisfactory completion of the required course of study, candidates will be awarded both the J.D. and M.D. degrees.

The student in the M.D.-J.D. program begins a six-year course of study in the School of Medicine. As in the regular M.D. program, the first year is devoted to the basic medical sciences and the second year to the basic clinical disciplines. At this point, the student usually enters the Law School, where the first-year curriculum is the same as that of other law students. During the next two years, the student may select courses in the Law School that are of special application to medical-legal interests. The sixth and final year is spent in elective clinical work in the Medical School tailored to the student's specialized needs. In addition, the student completes eighteen semester-hours, or two summer sessions, of elective basic science work.

Combined Master of Business Administration-Law Degree. The School of Law and the Graduate School of Business Administration of Duke University have established a combined program of studies in law and graduate level business administration. The aim of the program is to provide a small number of selected individuals with the opportunity to acquire an education in both law and business administration in a four-year course of closely integrated study in the two fields. Upon satisfactory completion of the required course of study, candidates will be awarded both the M.B.A. and the J.D. degrees.

The student in the M.B.A.-J.D. program begins the first-year course of study in either the Graduate School of Business Administration or the School of Law. If the student begins in the Law School, the first-year curriculum is the same as that of other law students; if the student begins in the Graduate School of Business Administration, the first-year curriculum is the same as that of other graduate business students. The student's second year consists of the full first-year program of the other school. In the third and fourth years of the program, the student takes a mix of courses in both schools, but mainly in the Law School.

Combined Master of Arts in Public Policy Sciences-Law Degree. The School of Law and the Institute of Policy Sciences of Duke University have established a combined program of studies in law and graduate level policy sciences. The aim of the program is to provide an opportunity for students to acquire decision-making skills and substantive policy knowledge that would be useful in either career or citizen roles dealing with problems of the public sector. Upon satisfactory completion of the required course of study, candidates will be awarded both the M.P.P.S. and the J.D. degrees.

The combined program requires completion of four academic years and one summer internship, of which the first year is spent exclusively in the Law School pursuing the same course of study as do other first-year law students; the second year exclusively in the Institute of Policy Sciences; and the third and fourth years in both schools, but mainly in the Law School. In addition, the student must select a substantive policy area in which to concentrate from among the fields of the administration of justice, communications policy, health policy, and educational policy.

Combined Master of Health Administration-Law Degree. The School of Law and the Department of Health Administration have established a combined program of studies in law and health administration. The aim of the program is to provide interested persons with the opportunity to acquire an education in both law and health administration in an integrated four-year course of study in the two fields. Upon satisfactory completion of the required course of study, candidates will be awarded both the M.H.A. and the J.D. degrees.

The student in the M.H.A.-J.D. program, after completing the first three semesters (twelve months) of the basic M.H.A. program, enters the Law School, where the first-year curriculum is the same as that of other law students. In the third and fourth years of the program, the student continues in the Law School, completing requirements for the law degree, including two electives approved by the Department of Health Administration, and takes ten more semester-hours of M.H.A. course work. In the Law School, the student is encouraged to emphasize courses relating to public law and administration. Opportunities for special activities in health law will be made available to the student by the Department of Health Administration over the course of the program.

M.A. in Legal Studies

Upon favorable recommendation of the faculty, the degree of Master of Arts in Legal Studies will be conferred upon students who have successfully completed a

one-year program of study in the Law School. Students specially admitted to candidacy for this degree will pursue an individually designed curriculum including both first-year and upperclass courses. The degree may also be awarded to J.D. candidates who meet its requirements and who decide to abandon the study of law.

Students will be deemed successfully to have completed a one-year program of study in the Law School if, during a minimum of thirty academic weeks, they have satisfied the following requirements:

1. a passing grade in Law School courses aggregating thirty-one semester hours, excluding cross-listed courses, and including at least one course requiring substantial supervised writing, and
2. a grade-point average of at least 2.0 on a 4.0 scale and status in good standing under the rules of the Law School.

Graduate Study in Law

The Law School program is primarily designed to serve students seeking a first professional degree in American law. Rarely are students admitted for the purpose of continuing the study of law at the master's or doctoral levels, although the faculty is empowered to authorize such admissions. Applications for such study by American graduates of American law schools are not sought. Foreign students should consult the chapter of this bulletin addressed to them.

Beyond the Curriculum



Publications

Law and Contemporary Problems. Since 1933, the Law School has published the quarterly, *Law and Contemporary Problems*. The journal is distinctive among professional legal publications in both its format and its content. Each issue is devoted to papers from a symposium on a particular topic of contemporary interest. These topics reflect an interdisciplinary perspective with contributions by lawyers, economists, social scientists, scholars in other disciplines, and public officials.

The journal is widely distributed, and its subscribers include general university libraries, governmental agencies, and foreign educational institutions, as well as the more traditional law libraries and law firms. Through arrangements with commercial publishers, selected issues of the journal are also reprinted for general book trade distribution.

About twenty upperclass law students serve on the staff of this publication. They are responsible for the editorial work, and contribute their own writing to the symposia. Ten second-year students are selected each year on the basis of their first-year grades and the evaluations of their first-year tutorial instructors. Five new third-year students are elected on the basis of their second-year grades.

Duke Law Journal. The Law School publishes the *Duke Law Journal* six times a year. Edited by students, the *Journal* is among the most prestigious and influential legal publications in the country. Approximately one-half of the contents of each issue consists of student notes dealing with current legal developments; the balance is devoted to articles and comments by professors and practitioners. Full responsibility for the selection and editing of material is vested in the *Journal's* student editorial board and its elected officers.

Membership on the *Journal* is achieved in one of two ways, each method accounting for approximately equal numbers of members. Several students are selected on the basis of outstanding performance during their first year of law school. Additionally, second-year students (including those transferring to Duke from other schools) may participate in a two-week writing program traditionally held at the beginning of the fall semester; participants demonstrating exceptional writing ability are invited to become members of the *Journal*.

Each year one *Journal* issue is devoted to topics in administrative law. Subjects of recent articles and notes reflect both the variety and depth of current legal thought; these subjects have included novel corporate takeover procedures, the status of derivative suit litigation, balancing the right of journalists to report news with the government's interest in restricting access to certain information, and the legality of various employer practices under federal laws prohibiting discrimination based on pregnancy.

Alaska Law Review. Beginning in 1983, Duke Law School will publish the *Alaska Law Review*. Alaska has the highest per capita percentage of lawyers of any American state, and a range of cutting edge legal issues in the areas of natural resources law, environmental law, land use planning, economic development, and Native American rights. Since Alaska has no law school, Duke has agreed with the Alaska Bar Association to provide a professional journal of law to serve the needs of the Alaska legal community.

The *Alaska Law Review* will be supervised by a board consisting of members of the Duke Law faculty and representatives of the Alaska Bar Association. The principal writing, editing, and management of the review will be the responsibility of ten second-year student editors and ten third-year senior editors. Ten students will be chosen for the review out of each rising second-year class on the basis of first-year grades and the recommendations of first-year tutorial writing instructors.

Duke Law Magazine. The Law School publishes a semi-annual review of the intellectual life of the school entitled *Duke Law Magazine*. Student-authored work is sometimes included, along with faculty essays and reports of events of academic significance to the school.

Honorary, Professional, and Social Organizations

Order of the Coif. The Order of the Coif is a national legal scholarship society with a local chapter at Duke University School of Law. Its purposes are "to foster a spirit of careful study and to mark in a fitting manner those who have attained a high grade of scholarship." Election is restricted to students standing scholastically in the highest 10 percent of the graduating class.

The Duke Bar Association. The Duke Bar Association coordinates the professional, social, and other extracurricular activities of the student body. The association resembles in its composition and purpose both a university student government and a professional bar association. It publicizes Law School activities, sponsors athletic and social programs, and disperses its dues fund among the school's organizations.

Legal Research Program. The Legal Research Program, supervised by a student editorial board, provides second- and third-year students with an opportunity to prepare legal memoranda on actual problems submitted by practicing lawyers, judges, or legislative committees.

Moot Court Board. The Moot Court Board is composed of second- and third-year students who are chosen on the basis of their performances in intramural moot court competition. The board supervises the Hardt Cup and the Dean's Cup Competitions. In addition, the board provides personnel for teams entering intercollegiate competition.

Duke Law Forum. The Duke Law Forum, through films, seminars, and speakers, traditionally seeks to stimulate and educate debate on national and legal issues. The forum has also sought to provide intellectual respite from the law by sponsoring lectures in various topics in literature, history, and philosophy.

International Law Society. Membership in the Duke International Law Society is open to the entire law student body. The society sponsors an annual distinguished speaker series with lecture topics ranging from the law of warfare to peace negotiations, from the law of the seas to space law. The scope is limited only by the interests of the society members and the student body at large. The society is currently exploring joint programs with local law schools, overseas study alternatives, and contributorships to international law journals throughout the country. Other activities include participation in the annual Philip C. Jessup International Moot Court Competition

and attendance at conferences sponsored by the Association of Student International Law Societies.

Women's Law Society. Women's Law Society provides a central organization through which women law students can meet to form friendships and to share problems unique to women in the legal profession. The group works as a clearinghouse for information in areas of particular concern to women through bulletin board notices and informal presentations at monthly potluck supper meetings. The group also communicates with women's groups in other law schools in North Carolina.

Council of Student Advisers. Members of the Council of Student Advisers are selected by the several deans of the Law School. Selection for membership reflects the collective judgment of the deans that the student is unusually deserving of trust and respect, and manifests traits for which the school would like to be known. The work of the council is to assist the administration of the Law School in its public contacts. Members represent the school in dealing with admissions applicants, placement interviewers, alumni, supporters, and guests. Membership in the organization generally continues after graduation; alumni members continue to assist in the same areas of administrative work. Membership involves a substantial commitment of time and energy to the welfare of the school.

Black American Law Students Association. The Law School chapter of BALSAs is affiliated with the regional and the national BALSAs. The aims of the local chapter are to provide a responsive student organization to aid the individual black law student at Duke and to instill a greater awareness of and commitment to the needs of the black community.

American Bar Association's Law Student Division. The ABA/LSD, active in virtually every law school in the country, is the way for law students to make contact with the nation's largest professional association for lawyers, the American Bar Association. A member of the Fourth Circuit, along with the law schools of Virginia, West Virginia, and North and South Carolina, Duke has played a strong leadership role in the circuit as well as at the national level of the division. A small enrollment fee entitles the Law Student Division member to a subscription to the ABA magazine *Student Lawyer*, to inexpensive ABA-sponsored health insurance, and to information about the ABA's programs and publications on specialized areas of the law. The ABA/LSD also promotes various advocacy and essay contests throughout the school year.

Forum for Legal Alternatives. The FLA is made up of students from all three classes who are interested in information about less traditional legal careers. In the past few years the FLA has brought lawyers to the Law School to speak on legal services, environmental law, union labor law, child advocacy, government work, and setting up a solo practice after law school. The group runs the Student Funded Fellowship, which collects donations from law students to provide public interest internships for several students each summer, and it also works with the Placement Office to provide information on employment opportunities in the public interest fields. The FLA maintains contacts with the North Carolina chapter of the National Lawyers' Guild and other public interest and civil rights groups in the area, and sponsors a VITA program in which student volunteers help low-income people prepare their tax returns. And as a respite from its serious work, the FLA has a potluck picnic each semester and runs a Law School volleyball league.

Legal Fraternities. The two legal fraternities are Hughes Inn of Phi Delta Phi and Wiley Rutledge Chapter of Phi Alpha Delta. These organizations sponsor luncheons, meetings featuring topics of professional interest, and several other social activities.



Entertainment and Recreation

Various recreational facilities are available on campus to students. The newly completed Bryan Center contains the Reynolds Theater and the Schaefer Laboratory Theater, as well as a film theater, an art gallery, banquet rooms which are available to students at minimal cost, and lounges and patios for student meetings.

Students of the Law School are also entitled to use the University gymnasiums, tennis courts, swimming pools, golf course, and other facilities. Within a short distance from the campus one may enjoy horseback riding, woodland hiking, and sailing. Other opportunities for physical activity are available in the intramural program, as well as through such activity groups as the outing, sailing, and cycling clubs. North Carolina's mild climate makes most outdoor sports possible during much of the school year. The Appalachian ski slopes are about three and a half hours to the west, the Outer Banks the same distance to the east.

University athletic contests are held on the campus at various times during the academic year. Duke is a member of the Atlantic Coast Conference.

Employment Opportunities

The study of law is demanding. It is designed to occupy the full time of the student and calls for the highest level of concentration. It is unwise for students to dilute their efforts by outside work, especially during the critical first year of study.

For those who find some outside earnings necessary to meet the expense of studying law at Duke and who qualify for the college work/study program under applicable federal regulations, arrangements have been made to provide some part-time employment in the Law School. A number of positions in the law library are filled by law students. Students are often employed in their second and third years as research assistants for faculty members. The University maintains a general placement office to aid in finding employment, and law students may serve as undergraduate residence advisers if they have been at Duke one year or have previously held such positions.

The opportunities for employment in the University and surrounding community are as good for spouses of law students who are teachers, computer programmers, secretaries, or nurses as in most other areas of the country. Other types of desirable positions are also available. A list of superintendents of schools in nearby districts is contained in the *Duke Law School Handbook* (see below). The University personnel office and the Medical Center personnel office assist interested persons in locating suitable employment on campus.

The Duke Law School Handbook

Incoming students are supplied with a handbook containing useful information which is compiled and updated each year by the DBA. Topics covered include housing, transportation, living needs and expenses, Law School facilities, student health facts including information on the University's Counseling and Psychological Services, and data for married students such as educational and employment opportunities. Also included in the handbook is information on facilities for the handicapped, for whom the school makes special provision as required above and beyond its already considerable accessibility.

Law Library

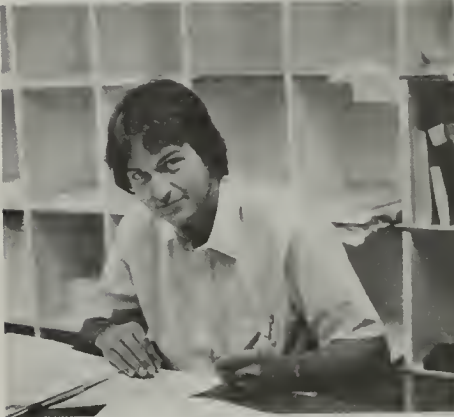
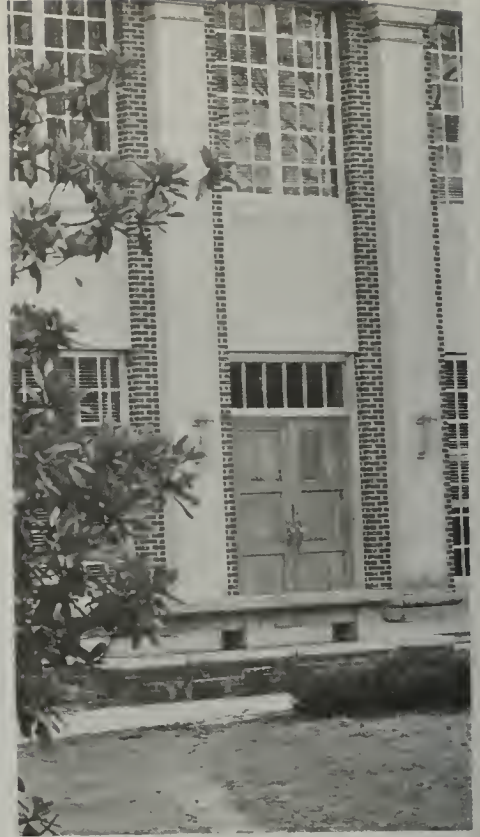


The written law in its variety of forms is the basic working material of the practicing attorney and the legal scholar. At Duke, law students utilize the resources of the library collection and the skills of the highly trained library staff in the development of research skills that will serve them throughout their professional careers.

The Duke Law Library holds a vision of itself as more than a repository of books. Recognizing its place at the center of the Law School community, the library offers accessible, well-organized collections and services. Open stacks are used throughout the library. Both group and individual study areas are arranged in proximity to the most-used materials. The entire collection of over 320,000 volumes is a major research collection designed for the educational needs of law students. It features comprehensive coverage of basic Anglo-American primary source materials, including nearly all reported decisions of federal and state courts, as well as current and retrospective collections of federal and state codes and session laws. Digests, legal encyclopedias, and other indexing devices provide access to the primary documents. Materials subject to heavy student use are available in multiple copies. Comprehensive collections of records and briefs from the United States Supreme Court, the Fourth Circuit Court of Appeals, and the North Carolina Supreme Court and Court of Appeals are maintained in microform and hard copy. The library maintains an extensive, and continuously expanding, collection of legal treatises. These are organized in the familiar Library of Congress classification system and are accessible through a public catalog, generated by a computer-based card-production system. Special treatise collections are maintained in several subject areas, including the George C. Christie collection in jurisprudence and the Floyd S. Riddick collection of autographed senatorial material.

The periodical collection includes extensive runs of all major legal research journals, bar association publications, institute proceedings, and newsletters. The library is a selective depository for United States government publications, with concentration on congressional and administrative law materials. Hard copy document holdings are supplemented by an extensive microform collection, which includes complete runs of the *Congressional Record* and the *Federal Register*, all post-1970 congressional materials, congressional committee prints dating back to the mid-nineteenth century, and a number of special subject collections. In addition, law students have access to the extensive documents collection of the main campus library. Important state government documents are collected in both hard copy and microform.

In addition to its Anglo-American holdings, the library holds substantial research collections in foreign and international law. The foreign law collection is extensive in coverage, with concentrations in European law and business law materials. The international law collection is strong in primary source and treatise material on both private and public international law topics.



But the success of a law school library depends as much on the quality of the services it provides as on the strengths of its collection. At Duke, the library staff includes eight librarians with graduate degrees, four of whom hold additional degrees in law. The staff takes its role in the legal education process seriously. The law-trained staff members serve as instructors for the legal bibliography segments of the first-year research and writing program and regularly offer seminars in topics of advanced legal research. A computer-assisted legal research service is available for research and training purposes. Instruction in legal research is also given through a series of slide/tape programs. Computer facilities provide access to self-instructional programs in substantive legal topics and to bibliographic data bases and comprehensive indexing services. The staff produces a series of research bibliographies and various current-awareness services and maintains bibliographies of books by Law School faculty members.

The library is part of the Law School and is administered independently of the main library system at Duke. The Duke University Libraries (Perkins, Law, and Mudd Medical) contain one of the major research collections in the country; the addition of the 3,000,000th volume was celebrated in 1979.

To obtain materials not available locally, the law library staff makes use of a computerized interlibrary loan network, which allows retrieval of information from libraries throughout the country. Cooperation with other libraries, both on and off campus, ensures that materials are available when needed for the Law School community.

The staff of the Law Library in 1983-84 includes the following professionals:

Richard A. Danner, B.A., M.S., J.D., *Director of the Law Library and Associate Professor of Legal Research*

Hope E. Breeze, B.A., M.L.S., *Assistant Cataloger*

Michael G. Chiorazzi, B.A., M.L.L., J.D., *Reference Librarian and Instructor in Legal Research*

Kathryn M. Christie, B.A., M.A., J.D., M.S.L.S., *Reference and Research Librarian and Instructor in Legal Research*

Janeen J. Denson, A.B., M.S.L.S., *Circulation Librarian*

Claire M. Germain, B.A., LL.B., M.C.L., M.L.L., *Head Reference Librarian and Lecturer in Comparative Law and Legal Research*

Katherine Kott, B.A., M.S.L.S., *Head of Technical Services*

Gretchen P. Wolf, B.S., M.S., *Acquisitions Librarian*

International Students



International Law Study at Duke

Each year the Law School warmly welcomes a limited number of highly qualified foreign students who seek exposure to the American legal system and profession. Overseas applicants should recognize that enormous difficulty inheres in the study of a foreign legal system. No other academic discipline is so inculturated and makes such enormous demands on the intellectual adaptability of the student. Such study may be particularly difficult at a small school like Duke, which can provide no special academic program to bridge the cultural gulf. Foreign students at Duke must, of necessity, enter into the regular program designed for very able professional students who are presumed to possess a substantial background in their own American culture. Moreover, law study makes substantial demands on the language skills of even those who are native users of English; if a language problem is added to the other inherent difficulties of foreign law study, the disadvantage to the foreign student is further increased.

The Law School does make an effort to help foreign students with their adjustment. The International Adviser assists with housing, immigration, and personal problems. Before the start of classes, a several-day orientation is held. Each foreign student is assigned to a faculty adviser, who is a member of the Committee on International and Comparative Studies. In addition, the University provides a wide variety of special services and facilities, which foreign students are encouraged to use.

Foreign students are usually required to take a first-year course. The purpose is to facilitate the integration of the foreign students into the intellectual and social life of the Law School by bringing them into close contact with a small group of Americans who are facing similar academic challenges. The remainder of the academic program is individualized, according to the goals, interests, and talents of the student. Programs of study will be planned with the help of the academic adviser.

Degree Programs for International Students

Foreign students may be considered for several different degree programs. Most foreign students seek graduate degrees; such students are already trained in the law of their own countries. They are usually admitted as candidates for the degree of Master of Comparative Law (M.C.L.). To qualify for this degree, the student must successfully complete two semesters of the study of law in residence, aggregating not less than twenty semester-hours. Included in the twenty credits of work must be at least two credits of individual written work. The written work requirements may be completed by independent study or in a regular seminar.



Foreign students who have a solid foundation in English and in a legal system not dissimilar to the American system may be admitted as candidates for the degree of Master of Laws (LL.M.). This degree may also be awarded to students admitted as candidates for the M.C.L. degree who have achieved the higher grade point average required for the LL.M. degree. Candidates are expected to complete the requirements for the M.C.L. and LL.M. degrees in one year.

Foreign students who have already earned a degree in American law at the master's level may be admitted as candidates for the degree of Doctor of Juridical Science (S.J.D.). To qualify for this degree, the student must successfully complete a monograph or series of essays suitable for publication and deemed by the faculty to be of distinguished character, and pass an oral examination before a special committee of the faculty appointed for that purpose. Students applying for admission to this program must present a fairly specific plan of study and writing with their application. They must provide evidence of outstanding prior academic performance.

Finally, foreign students may be admitted as candidates for the degree of Doctor of Law (J.D.). This is the program that should be pursued by students who expect to achieve solid professional capacity to handle the intellectual difficulties of American law. Such candidates must present a satisfactory score on the Law School Admission Test (LSAT) administered to regular American applicants. Those who have earned professional law degrees in systems not dissimilar to the American system may receive credit for as much as one-third of the course work ordinarily required for the completion of the J.D. program; thus, it is possible for some foreign students to complete this program in two years rather than the usual three. Inquiries about the J.D. program should be directed to the admissions office.

Admission of International Students

A separate admission process is maintained for foreign students applying to graduate programs. Prospective applicants should write for forms and information to Judith Horowitz, Administrator for International Studies. The usual application fee is charged. Students who are not native speakers of English are also required to present a satisfactory score on the Test of English as a Foreign Language (TOEFL), which is administered by the Educational Testing Service of Princeton, New Jersey. For further information, appropriate officials at the student's university should be consulted.

Applications should normally reach Duke by no later than February 15. Admission is for the fall semester only.

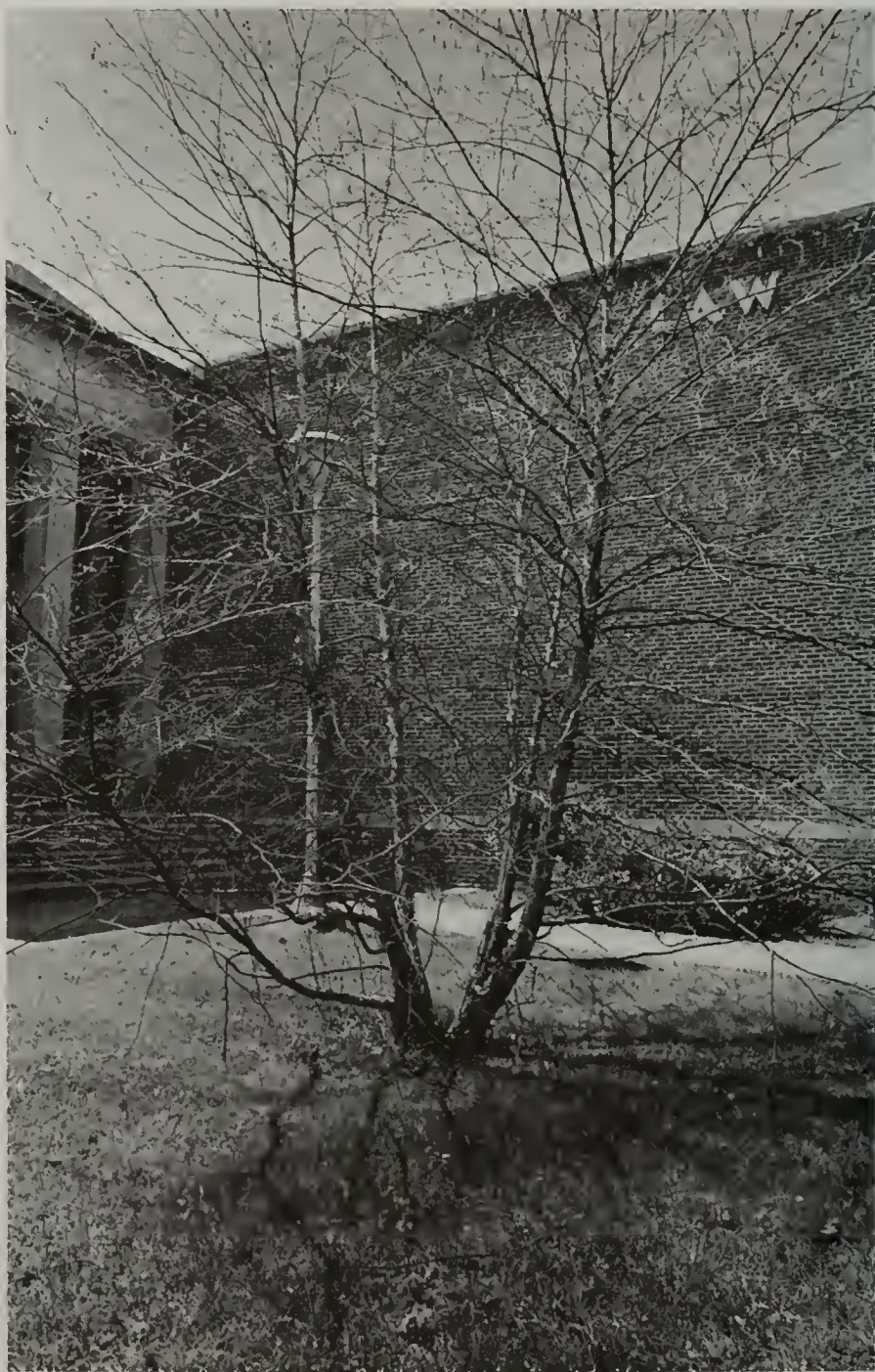
Financial Aid

Unfortunately, Duke can offer no financial assistance to foreign students. Foreign applicants will be required to supply assurance of their ability to pay their tuition and their personal expenses. The usual deposit will be required to confirm acceptance of a position at the Law School.

Placement with American Law Firms

The Duke program for international students is directed primarily to those that will return to their home countries upon receipt of their degrees. Some students have found, however, that their exposure to the American legal system is enriched by a short internship with an American law firm before returning home. The placement office does not have a formal placement program for such students but does maintain a list of American law firms that have expressed an interest in interviewing foreign students, and it will assist in scheduling interviews.

Placement



Placement Service

Placement of law students and graduates is the concern of an active placement office. Its staff includes the Director of Placement who is a faculty member, a full-time Placement Officer and assistant, and several student assistants. The activities of the placement office can be broken down into several categories: coordination of an extensive on-campus recruiting season; custodial responsibility for a wealth of materials on legal careers, available positions, bar membership, and other related matters; and assisting students and recent graduates throughout the year in the job placement process.

The on-campus recruiting occurs primarily during the fall of the year, when about 400 employers send representatives to interview members of the two upper classes. As a result of these interviews, a substantial number of students in each of these classes receive offers of employment.

About 90 percent of each graduating class report their employment plans prior to graduation. About one in ten begin their professional careers as judicial clerks, including several who serve on the staffs of federal appellate judges. Among those beginning their careers with private firms, New York, Washington, Atlanta, Los Angeles, and other cities in the south, east, and midwest are the most common locations. Beginning salaries exceed \$43,000 in the largest cities, but the median for first jobs is substantially lower.

The placement office encourages students to explore the variety of professional opportunities available to them and seeks to instruct them in effective job-hunting as well. It should be noted, however, that the students themselves are primarily responsible for finding their own employment. They must be willing to devote a large amount of their time to letter-writing and to interviewing. The Law School diligently attempts to assist its graduates, but the ultimate responsibility rests with each student.

Bar Examinations and Requirements

Many states now require that students, prior to or shortly after beginning the study of law, register with the Board of Bar Examiners of the state in which they plan to practice. Prior to selecting the law school they will attend, at matriculation, and at the beginning of each subsequent year of law school, applicants are advised to consult the rules of all states in which they may be interested in practicing after graduation to determine the curriculum and other requirements of state bar examining authorities.

Appendix A

Former Schools of Duke Law Students

Agnes Scott College	1	Harvard University	13
Allegheny College	1	Haverford College	4
Alma College	1	Howard University	2
American University	1	Illinois State University	1
Amherst College	1	Illinois Wesleyan University	1
Antioch College	1	Indiana University	2
Appalachian State University	1	Ithaca College	1
Arizona State University	1	James Madison University	1
Baylor University	2	Johns Hopkins University	10
Beijing Institute of Foreign Trade	1	Kalamazoo College	1
Birmingham-Southern College	1	Kansas State University	2
Boston College	7	Kenyon College	3
Bradley University	1	King's College	1
Brandeis University	4	Knox College	1
Brigham Young University	1	La Salle College	1
Brown University	8	Lawrence University	1
Bucknell University	2	Lehigh University	1
California State University at Long Beach	1	Loyola University	1
Calvin College	1	Marquette University	1
Carleton College	1	Massachusetts Institute of Technology	3
Carnegie-Mellon University	1	Mercer University	1
City University of New York at Queens	3	Miami University	6
Claremont Men's College	3	Michigan State University	1
Clark University	1	Middlebury College	2
Colby College	1	Millsaps College	1
Colgate University	10	Mount Holyoke College	6
College of the Holy Cross	2	Mount St. Mary's College	1
College of William and Mary	1	Muhlenberg College	2
College of Wooster	1	Murray State University	1
Colorado College	1	New York University	3
Colorado State University	1	North Carolina State University	2
Columbia College of South Carolina	1	North Dakota State University	1
Columbia University	4	Northwestern University	2
Connecticut College	1	Oberlin College	2
Cornell University	13	Ohio State University	1
Dartmouth College	3	Ohio University	2
Davidson College	6	Ohio Wesleyan	1
DePaul University	2	Oklahoma Baptist University	1
DePauw University	1	Pace University	1
Dickinson College	1	Pennsylvania State University	3
Drake University	1	Portland State University	1
Drew University	2	Princeton University	12
Duke University	55	Providence College	1
East Tennessee State University	1	Purdue University	1
Eastern Illinois University	1	Rice University	2
Eckerd College	1	Rollins College	1
Eisenhower College	1	Saint Johns University	1
Emory University	1	Saint Lawrence University	2
Fairmont State College	1	Saint Louis University	2
Florida State University	5	Saint Norbert College	1
Fordham University	2	Sarah Lawrence College	1
Franklin and Marshall College	1	Skidmore College	1
Furman University	1	Smith College	5
George Washington University	2	Southwestern at Memphis	2
Georgetown College—Kentucky	1	Southwestern College—Kansas	1
Georgetown University	5	Stanford University	4
Georgia Institute of Technology	1	State University of New York at Albany	3
Georgia Southern College	1	State University of New York at Binghamton	11
Guilford College	1	State University of New York at Buffalo	3
Harding College	1	State University of New York at Stony Brook	4

Stetson University	2	University of New Haven	1
Swarthmore College	2	University of New Mexico	1
Sweet Briar College	1	University of North Carolina at Chapel Hill	7
Syracuse University	4	University of North Carolina at Greensboro	1
Temple University	1	University of Notre Dame	20
Tennessee Technological University	1	University of Oklahoma	3
Tennessee Temple University	1	University of Pennsylvania	7
Trevecca Nazarene College	1	University of Redlands	1
Trinity College	1	University of Rhode Island	1
Tufts University	3	University of Rochester	4
Tulane University	2	University of the South	1
Union College	4	University of South Alabama	1
United States Air Force Academy	6	University of South Carolina	3
United States Military Academy	5	University of South Florida	5
United States Naval Academy	2	University of Southern California	1
University of Akron	1	University of Tennessee	3
University of Alabama	2	University of Texas	2
University of Alaska	1	University of Toledo	2
University of Arizona	1	University of Utah	1
University of Arkansas	1	University of Virginia	6
University of California at Berkeley	5	University of Washington	2
University of California at Los Angeles	3	University of Wisconsin	3
University of California at Santa Barbara	1	Utah State University	1
University of Chicago	5	Valparaiso University	2
University of Cincinnati	1	Vanderbilt University	7
University of Colorado	1	Vassar College	2
University of Connecticut	2	Virginia Polytechnic Institute and State University	1
University of Delaware	2	Wabash College	5
University of Denver	1	Wake Forest University	5
University of Florida	7	Washington and Jefferson College	1
University of Georgia	2	Washington and Lee University	2
University of Illinois	1	Wellesley College	3
University of Iowa	1	Wesleyan University	5
University of Maryland	3	West Virginia University	1
University of Massachusetts	4	Western Carolina University	1
University of Miami	4	Western Washington University	1
University of Michigan	6	William Jewell College	1
University of Minnesota	1	Williams College	2
University of Mississippi	1	Wittenberg University	1
University of Missouri	2	Wofford College	1
University of Missouri at Columbia	1	Yale University	7
University of New Hampshire	1		

Appendix B

Home States of Duke Law Students

Alabama	9	Maine	1
Alaska	1	Maryland	22
Arizona	3	Massachusetts	20
Arkansas	2	Michigan	8
California	18	Minnesota	6
Colorado	4	Mississippi	5
Connecticut	19	Missouri	9
Delaware	4	Nevada	1
District of Columbia	4	New Hampshire	2
Florida	51	New Jersey	22
Georgia	22	New Mexico	3
Idaho	1	New York	98
Illinois	22	North Carolina	45
Indiana	14	Ohio	35
Iowa	2	Oklahoma	6
Kansas	6	Oregon	2
Kentucky	6	Pennsylvania	35
Louisiana	3	Rhode Island	3

South Carolina	11	Virginia	7
Tennessee	12	Washington	1
Texas	6	West Virginia	5
Utah	2	Wisconsin	4
Vermont	1	Virgin Islands	1

Foreign Countries

Belgium	1	France	1
Canada	1	India	1
China	1	Kuwait	1
Denmark	3	Saudi Arabia	1
		Switzerland	1



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bulletin of
Duke University 1983-84

The Divinity School



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Duke University 1983-84

The Divinity School

EDITOR
Judy A. Beck
SENIOR EDITORIAL ASSISTANT
Elizabeth Matheson

PHOTOGRAPHS
Thad Sparks

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The information in the bulletin applies to the academic year 1983-84 and is accurate and current, to the best of our knowledge, as of February 1983. The University reserves the right to change programs of study, academic requirements, lecturers, teaching staffs, the announced University calendar, and other matters described in the bulletin without prior notice, in accordance with established procedures.

Duke University does not discriminate on the basis of race, color, national and ethnic origin, sex, handicap, or age in the administration of educational policies, admission policies, financial aid, employment, or any other University program or activity. It admits qualified students to all the rights, privileges, programs, and activities generally accorded or made available to students. For further information, call Dolores L. Burke, Equal Opportunity Officer, (919) 684-8111.

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Calendar of the Divinity School

1983

August	
24	Wednesday—Orientation for new students begins
25	Thursday—Orientation continues
26	Friday, 9:00-10:30 A.M.—Registration for returning students; 10:30-12:00 noon—Registration for new students
29	Monday—Fall semester classes begin
29	Monday—Drop/add period begins
30	Tuesday, 7:30 P.M.—Divinity School opening convocation
September	
9	Friday, 12:00 noon—Drop/add period ends
October	
7	Friday, 5:00 P.M.—Fall recess begins
17	Monday—Classes resume
26-27	Wednesday-Thursday—Registration for spring semester
November	
7-9	Monday-Wednesday—Divinity School Convocation and Pastors' School and Gray Lectures
24-25	Thursday-Friday—Thanksgiving recess
28	Monday—Classes resume
December	
9	Friday—Fall semester classes end
13	Tuesday—Final examinations begin
16	Friday—Final examinations end

1984

January	
5	Thursday—Orientation for new students
6	Friday—Registration for new students; registration changes for returning students
9	Monday—Spring semester classes begin
9	Monday—Drop/add period begins
20	Friday, 12:00 noon—Drop/add period ends
March	
2	Friday, 5:00 P.M.—Spring recess begins
12	Monday—Spring recess ends; classes resume
20-21	Tuesday-Wednesday—Registration for fall semester
April	
18	Wednesday, 11:00 A.M.—Divinity School closing convocation
19	Thursday—Spring semester classes end
24	Tuesday—Final examinations begin
27	Friday—Final examinations end
May	
5	Saturday, 6:30 P.M.—Divinity School baccalaureate service
6	Sunday, 3:00 P.M.—Commencement exercises

University Administration

GENERAL ADMINISTRATION

Terry Sanford, J.D., LL.D., D.H., L.H.D., D.P.A., *President*
H. Keith H. Brodie, M.D., *Chancellor and Acting Provost*
Charles B. Huestis, *Vice-President for Business and Finance*
William G. Anlyan, M.D., D.Sc., *Vice-President for Health Affairs*
Eugene J. McDonald, LL.M., *Vice-President for Government Relations and University Counsel*
John J. Piva, Jr., B.A., *Vice-President for Development and Alumni Affairs*
William J. Griffith, A.B., *Vice-President for Student Affairs*
Stephen Cannada Harward, A.B., C.P.A., *Treasurer and Assistant Secretary*
J. Peyton Fuller, A.B., *Associate Vice-President and Corporate Controller*
Roger L. Marshall, A.B., *Secretary of the University*
Andrew G. Wallace, M.D., *Associate Vice-President for Health Affairs*
Joel L. Fleishman, LL.M., *Vice-Chancellor*

DIVINITY SCHOOL EDUCATIONAL ADMINISTRATION

Dennis M. Campbell (1979), B.D., Ph.D., *Dean of the Divinity School*
Robert L. Wilson (1970), B.D., Ph.D., *Associate Dean for Curricular Affairs*
B. Maurice Ritchie (1973), B.D., *Assistant Dean for Field Education and Student Services*
Paula Elizabeth Gilbert (1980), M.Div., *Director of Admissions and Student Affairs*
Wilson O. Weldon (1981), B.D., D.D., *Special Assistant to the Dean*
Wesley F. Brown (1981), M.Div., *Assistant to the Dean for Development and Alumni Affairs*
Clara S. Godwin (1969), *Administrative Assistant for General Administration and Finance*

Division of Special Programs

Richard A. Goodling (1959), B.D., Ph.D., *Director of Programs in Pastoral Psychology*
Peter G. Keese (1973), S.T.B., Th.M., *Director of Clinical Pastoral Education*
Robert L. Wilson (1970), B.D., Ph.D., *Director, J. M. Ormond Center for Research, Planning, and Development*

Division of Advanced Studies

Eric M. Meyers, (1969), Ph.D., *Director of Graduate Studies in Religion*

Library

Donn Michael Farris (1959), M.Div., M.S. in L.S., *Librarian*
Harriet V. Leonard (1960), M.Div., M.S. in L.S., *Reference Librarian*
Linda Gard, A.B., M.Div., *Circulation Librarian*
Deborah B. Stewart, B.A., *Assistant to the Librarian*

SECRETARIAL STAFF

Carol Bailey, *Faculty Secretary*
Anita Gail Chappell, *Faculty Secretary*
Mary P. Chestnut, *Faculty Secretary*
Norma J. Dockery, *Secretary, Office of Black Church Affairs and Faculty Secretary*
Sarah Freedman, M.A., *Faculty Secretary*
Maxie B. Honeycutt, *Administrative Secretary for Student Financial Aid*
Patsy E. Martin, *Administrative Secretary, Office of the Dean*
Margie M. Meeler, *Secretary to the Assistant Dean for Field Education and Student Services*
Jacquelyn P. Norris, *Secretary to the Director of Admissions and Student Affairs*
Frances D. Parrish, *Administrative Secretary, Secretarial Staff*
Anne C. Ragan, *Secretary to the Director of the J. M. Ormond Center for Research, Planning, and Development and Faculty Secretary*
Candice Y. Sloan, M.Div., *Administrative Secretary, Office of Continuing Education*
Marie Smith, *Secretary to the Associate Dean for External Affairs and Faculty Secretary*
Mary C. Tilley, *Administrative Secretary, Registry*

FACULTY

Lloyd Richard Bailey (1971), B.D., Ph.D., *Associate Professor of Old Testament*
Waldo Beach (1946), B.D., Ph.D., *Professor of Christian Ethics*
Dennis M. Campbell (1979), B.D., Ph.D., *Professor of Theology*

*James Michael Efird (1962), B.D., Ph.D., *Associate Professor of Biblical Languages and Interpretation*
 Donn Michael Farris (1950), M.Div., M.S. in L.S., *Professor of Theological Bibliography*
 Richard A. Goodling (1959), B.D., Ph.D., *Professor of Pastoral Psychology*
 Robert Clark Gregg (1974), S.T.B., Ph.D., *Associate Professor of Patristics and Medieval Church History*
 Stuart C. Henry (1959), B.D., Ph.D., *Professor of American Christianity*
 Frederick Herzog (1960), Th.D., *Professor of Systematic Theology*
 *Osmond Kelly Ingram (1959), B.D., *Professor of Parish Ministry*
 Creighton Lacy (1953), B.D., Ph.D., *Professor of World Christianity*
 Thomas A. Langford (1956), B.D., Ph.D., D.D., *Professor of Systematic Theology*
 Richard Lischer (1979), M.A., B.D., Ph.D., *Assistant Professor of Homiletics*
 Paul A. Mickey (1970), B.D., Ph.D., *Associate Professor of Pastoral Theology*
 Roland E. Murphy (1971), M.A., S.T.D., S.S.L., *George Washington Ivey Professor of Old Testament*
 C. G. Newsome (1978), M.Div., Ph.D., *Assistant Professor of American Christianity*
 McMurry S. Richey (1954), B.D., Ph.D., *Professor of Theology and Christian Nurture*
 Charles K. Robinson (1961), B.D., Ph.D., *Associate Professor of Philosophical Theology*
 Dwight Moody Smith, Jr. (1965), B.D., Ph.D., *Professor of New Testament Interpretation*
 Harmon L. Smith (1962), B.D., Ph.D., *Professor of Moral Theology*
 David Curtis Steinmetz (1971), B.D., Th.D., *Professor of Church History and Doctrine*
 William C. Turner, Jr. (1982), M.Div., *Instructor in Theology and Black Church Studies*
 John H. Westerhoff III (1974), M.Div., Ed.D., *Professor of Religion and Education*
 Robert L. Wilson (1970), B.D., Ph.D., *Research Professor of Church and Society*
 Franklin Woodrow Young (1968), B.D., Ph.D., *Amos Ragan Kearns Professor of New Testament and Patristic Studies*

FACULTY, DEPARTMENT OF RELIGION

(Teachers in graduate program in religion whose courses are open to Divinity School students.)

Kalman Bland (1973), Ph.D., *Associate Professor of Judaic Studies*
 David G. Bradley (1949), Ph.D., *Professor of History of Religions*
 James H. Charlesworth (1969), B.D., Ph.D., *Associate Professor of New Testament*
 Elizabeth Clark (1982), Ph.D., *Professor of History of Christianity*
 Roger Corless (1970), Ph.D., *Associate Professor of History of Religions*
 Wesley A. Kort (1965), Ph.D., *Professor of Religion and Literature*
 Bruce B. Lawrence (1971), Ph.D., *Professor of History of Religions*
 C. Eric Lincoln (1976), Ph.D., *Professor of Sociology of Religion*
 Charles H. Long (1974), Ph.D., *Professor of History of Religions*
 Carol L. Meyers (1979), Ph.D., *Assistant Professor of Old Testament*
 Eric M. Meyers (1969), Ph.D., *Professor of Judaic Studies*
 Robert T. Osborn (1954), Ph.D., *Professor of Theology*
 Harry B. Partin (1964), Ph.D., *Associate Professor of History of Religions*
 William H. Poteat (1960), Ph.D., *Professor of Religion and Culture*
 James L. Price (1952), Ph.D., *Professor of New Testament*
 Orval Wintermute (1958), Ph.D., *Professor of Old Testament*

RELATED FACULTY

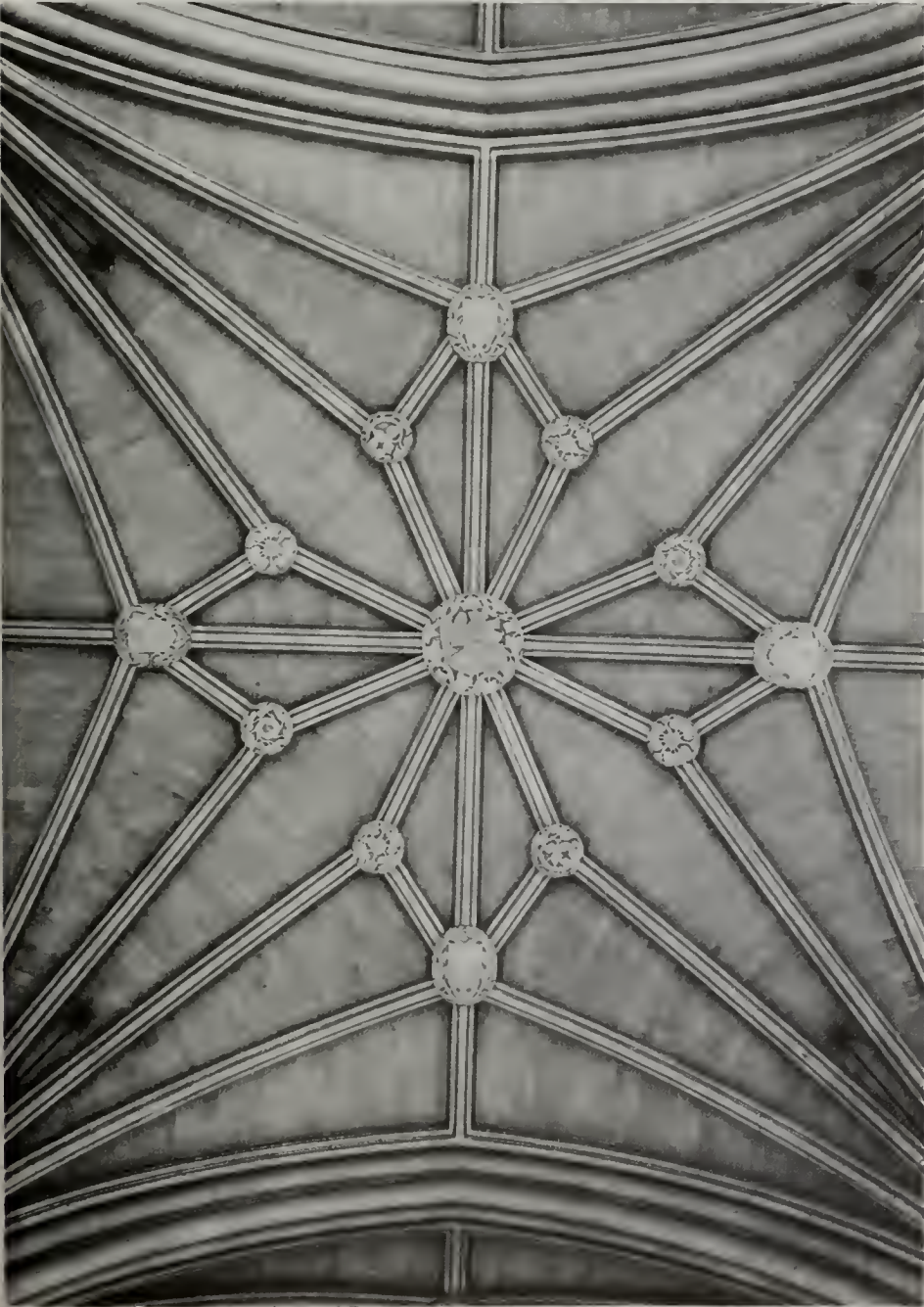
Albert F. Fisher (1974), M.Div., *Adjunct Professor of Parish Work*
 P. Wesley Aitken (1953), B.D., Th.M., *Chaplain Supervisor of Duke Medical Center and Associate in Instruction, the Divinity School*
 John C. Detwiler (1966), B.D., Th.M., *Chaplain Supervisor of Duke Medical Center and Associate in Instruction, the Divinity School*
 W. Kenneth Goodson, B.D., D.D., *Bishop-in-Residence*
 Ruth E. Harper, M.Div., *Visiting Lecturer in Ministerial Studies*
 Bonnie S. Jones, B.S., *Visiting Lecturer in Church Music and Director of Divinity School Choir*
 Peter G. Keese (1973), S.T.B., Th.M., *Chaplain Supervisor of Duke Medical Center and Associate in Instruction, the Divinity School*
 Jose Miguez-Bonino, B.D., Ph.D., *Visiting Professor of Theology*

EMERITI

Frank Baker (1960), B.D., Ph.D., *Professor Emeritus of English Church History*
 Robert Earl Cushman (1945), B.D., Ph.D., Litt.D., *Research Professor Emeritus of Systematic Theology*

*Sabbatical leave, fall 1983.

William David Davies (1966), M.A., F.B.A., D.Litt., *George Washington Ivey Professor Emeritus of Advanced Studies and Research in Christian Origins*
William Arthur Kale (1952), B.D., D.D., *Professor Emeritus of Christian Education*
M. Wilson Nesbitt (1958), B.D., D.D., *Adjunct Professor Emeritus of the Work of the Rural Church*
Ray C. Petry (1937), Ph.D., LL.D., *James B. Duke Professor Emeritus of Church History*
John Jesse Rudin II (1945), B.D., Ph.D., *Associate Professor Emeritus of Liturgy and Worship*
H. Shelton Smith (1931), Ph.D., D.D., Litt.D., *James B. Duke Professor Emeritus of American Religious Thought*
William Franklin Stinespring (1936), Ph.D., *Professor Emeritus of Old Testament and Semitics*
Arley John Walton (1948), B.S.L., D.D., *Professor Emeritus of Church Administration and Director of Field Work*



General Information



History

Duke University as it exists today developed from simple beginnings. Established in 1838, Union Institute became a normal college by 1851 and in 1859 was renamed Trinity College. In 1892 the college moved to Durham, North Carolina.

In 1924 James B. Duke established a trust fund for educational and charitable purposes. The chief beneficiary was Trinity College, which became Duke University. The purpose for establishing the trust was very clear: "I have selected Duke University as one of the principal objects of this trust because I recognize that education, when conducted along sane and practical, as opposed to dogmatic and theoretical lines, is, next to religion, the greatest civilizing influence And I advise that the courses at this institution be arranged, first, with special reference to the training of preachers, teachers, lawyers, and physicians, because these are most in the public eye, and by precept and example can do most to uplift mankind" The School of Religion began its work in the academic year 1926-27, and formal exercises for its opening were held on 9 November 1926. In 1940 the name was changed to the Divinity School.

During its history the Divinity School has had outstanding teachers, scholars, and administrative leaders,* and its graduates have distinguished themselves by making significant contributions to the church and the world. In 1964 a program of expansion was begun, culminating in February 1972, when the Divinity School doubled its physical facilities and moved into a handsome new building.

The Role of the Divinity School

The Divinity School represents theological inquiry and learning within the greater University. By history and indenture, it stands within the Christian tradition and recognizes its distinctive lineage in as well as its continuing obligation to the United Methodist Church. The Divinity School, although United Methodist in tradition and dependency, receives students from many Christian denominations and offers its educational resources to representatives of the several communions who seek an education for a church-related ministry. From its inception, it has been ecumenical in aspiration, teaching, and practice, as well as in its faculty. Educational policy has

*Since the institution of the school in 1926, the following persons have served as Deans or Acting Deans: Edmund Davidson Soper, 1926-28; Elbert Russell, 1928-41; Paul Neff Garber, 1941-44; Harvie Branscomb, 1944-46; Gilbert T. Rowe, Acting Dean of the Faculty, 1946-47; Paul E. Root (elected in 1947 but died before assuming office); Harold A. Bosley; 1947-50; James Cannon III, Acting Dean 1950-51, Dean 1951-58; Robert Earl Cushman, 1958-71; Thomas A. Langford, 1971-81; Jameson Jones, 1981-82; Dennis M. Campbell, 1982—.

consistently aspired to foster a Christian understanding “truly catholic, truly evangelical, and truly reformed.”

The principal purpose of the Divinity School is the professional education for the ministry, which in today's world is manifested in a variety of forms. Provision to implement these increasing variations of ministry is a part of the school's curricular resources.

Although the conventional and inherited styles of ministry are now undergoing change, the Divinity School curriculum continues to prepare students for informed and discriminating discharge of the historic offices of church and congregation through the ministry of word and sacrament, pastoral care, and teaching. The Divinity School believes these offices will remain, although the form and context of the local church may change.

With this in mind, the Divinity School tries to prepare students for the mature performance of their vocation. It hopes to develop in each student a disciplined intelligence, informed by sound learning and equipped for worthy professional service. The resources are offered to students with a diversity of ministerial aims, although the school seeks, by recruitment and financial support, to prepare persons for ordination or lay professional vocations in the churches. This is regarded as a service to the Church, to the world, and primarily to the Lord of the Church.

The Relation of the Divinity School to Duke University

The Divinity School is an integral part of the University and shares fully in its activities, privileges, and responsibilities. The Sunday services in the University Chapel give Divinity School students each year an opportunity to hear several of the country's leading ministers. The University libraries make a rich collection of books and other materials easily accessible. Without paying additional fees, selected courses in the graduate and professional schools are open to Divinity School students, as well as the general, cultural, and recreational resources of the University.



Library Resources

Divinity School Library. The Divinity School Library contains a collection of more than 210,000 volumes in the field of religion and related disciplines and affords an unusual wealth of material for the seminary student. Although an integral part of the University's eleven-unit library system, which possesses more than 3,000,000 volumes, the Divinity School Library has its own separate facilities in the Divinity School Building. Its book collection is operated on the open stack system, and its reading rooms provide study facilities for students, space for the special reference collection in religion, and for the more than 600 religious periodicals to which the library currently subscribes.

Staffed by a librarian and a reference librarian trained in theology as well as library administration, by a supporting staff of three persons, and by a number of student assistants, the Divinity School Library offers a variety of reference services to assist the student in selecting and locating materials. The staff, in cooperation with the faculty, maintains a book and periodical collection to support basic courses and advanced research in all major fields of religious studies.

The Divinity School Library is adjacent to the Perkins Library. The seminary student may use the resources and facilities of the Perkins Library, some of which include manuscripts, archives, public documents, newspapers, periodicals, microfilms, maps, rare materials (among which are eighty-one prized ancient Greek manuscripts), and reference assistance. There is a provision for borrowing books from the libraries of the University of North Carolina and other neighboring institutions.

Admissions



Requirements and Procedures

The Divinity School is a fully accredited member of the Association of Theological Schools and is one of thirteen accredited seminaries of the United Methodist Church. It considers candidates for admission who hold an A.B. degree, or its equivalent, from a college approved by a regional accrediting body.

Preseminary Curriculum. The Divinity School follows the guidelines of the Association of Theological Schools with respect to undergraduate preparation for theological study. In general, this means a strong background in liberal arts, especially the humanities. A well-rounded background in English language and literature, history, philosophy, psychology, religion, social science, and foreign languages is especially desirable.

Application Procedures. Application forms secured from the admissions office should be filed six to twelve months in advance of the intended date of enrollment. Ordinarily, no application for a degree program will be accepted after 15 May and 15 November for September and January enrollments, respectively. The student should provide the following supporting documents and information: (1) one copy of the official transcript from each college, university, or seminary attended sent directly to the Director of Admissions by the institution; (2) one supplementary transcript, sent as soon as possible, showing completion of work which was in progress when the earlier transcript was made; and (3) the names of five persons best qualified to judge the applicant as a prospective student in the Divinity School who will be contacted by the school for written letters of recommendation. *Materials submitted in support of an application are not released for other purposes and cannot be returned to the applicant.*

Applicants are strongly urged to come for on-campus visits and interviews prior to final admission. A minimum of thirty days is required to process any application for a degree program.

Graduates of unaccredited senior colleges and universities may apply for admission but will be admitted only on a limited program basis.

Additional Procedures for International Students. Fully qualified students from outside the United States are welcome to apply for admission to the Divinity School. In applying for admission the international student must, in addition to the information required of all students, submit with the application material: (1) if the student's native language is not English, certification of English proficiency demonstrated by scores from the Test of English as a Foreign Language (TOEFL), administered through the Educational Testing Service in Princeton, New Jersey, (the Divinity School re-

quires a score of 550 or higher on the TOEFL); (2) a statement of endorsement from an official of the student's national ecclesiastical body, affirming that ecclesiastical body's support for the student's pursuit of theological studies in the United States and welcoming the student into active ministry under its jurisdiction following the student's study in this country; and (3) a statement demonstrating financial arrangements for the proposed term at the Divinity School (estimated costs per calendar year are \$10,000*). *An international student must submit scores from the TOEFL, a financial statement, an endorsement by an official of an ecclesiastical body, and have all transcripts and five letters of recommendation sent to the Admissions Office of the Divinity School before the Divinity School will make any offer of admission.*

Admission Requirements. Those persons are encouraged to apply:

1. who have or will have been awarded a bachelor's degree from a regionally accredited college or university prior to their intended date of enrollment;
2. who have attained at least an overall B-(2.65 on 4.0 scale) academic average; and
3. who are committed to some form of ordained or lay ministry.

Applicants are evaluated on the basis of academic attainment, future promise for ministry, and vocational clarity and commitment.

Admission on Limited Program. Limited program is a special relation between the school and the student, designed to encourage and support academic achievement. Students may be admitted on limited program for a number of reasons including an undergraduate degree in a program other than liberal arts, an undergraduate degree from a nonaccredited college, or an undergraduate transcript that does not fully meet Divinity School standards.



*Figures are based on 1982-83 charges and are subject to change.

Limited program means reduced schedules of work, with the amount determined by the Associate Dean for Curricular Affairs (ordinarily no more than three courses each of the first two semesters), and also includes a review of work at the end of each semester by the Committee on Academic Standing until limited program is lifted.

Admission as a Special Student. Special student status is a restricted category of admission for persons who do not have need of a degree program and who desire access to the rich offerings of the Divinity School curriculum for particular purposes. Special student status may be granted after a person has submitted an application and all transcripts of undergraduate academic work and when all three letters of recommendation have been received from listed references. Applications for special student status must be submitted at least thirty days prior to the intended date of enrollment. *Special students are ineligible for any form of financial assistance through the Divinity School.*

Admission Acceptance. Applicants are expected to indicate their acceptance of admission within three weeks and to confirm this with the payment of an admission fee of \$50. Upon matriculation, this fee is applied to the first semester tuition charge.

To complete admission students must provide a certificate of immunization and general health to the student health service. The admission office must also receive a final transcript verifying the conferral of the undergraduate degree.

Persons who do not matriculate at the time for which they were originally admitted forfeit admission unless they present a written request for postponement to the Director of Admissions and Student Affairs.

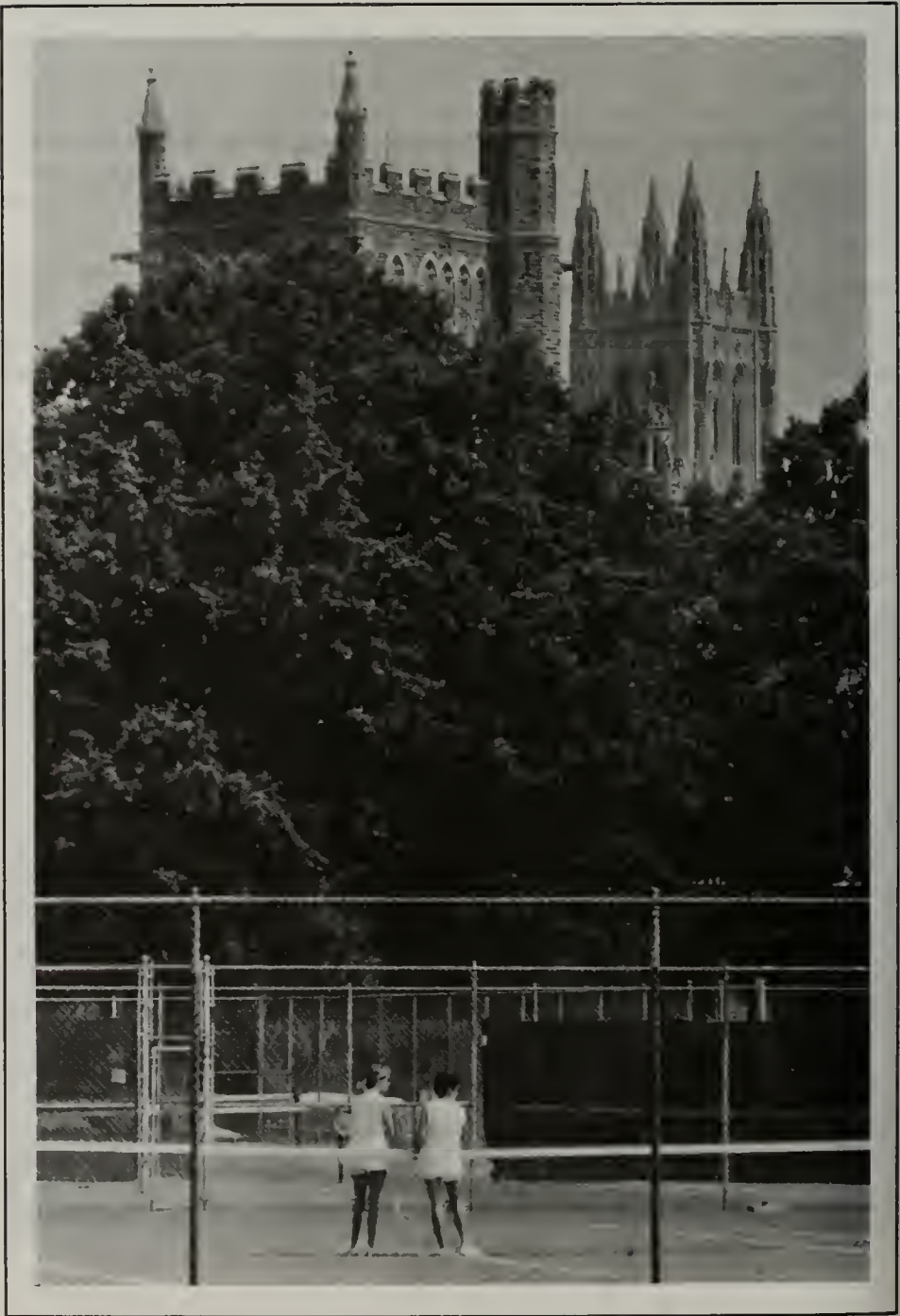
Transfer of Credit. Transfer of credit from theological schools accredited by the Association of Theological Schools is allowed by the Divinity School. Credit from another institution will normally be limited to one-third of the total number of credits required for graduation by the Divinity School. In each case a letter of honorable dismissal from the school from which transfer is made is required along with a transcript of academic credits. Applicants for transfer into a degree program are evaluated on the same basis as other applicants.

Conduct of Students

Duke University expects and will require of all its students continuing loyal cooperation in developing and maintaining high standards of scholarship and conduct. The University wishes to emphasize its policy that all student are subject to the rules and regulations of the University currently in effect, or which are put into effect from time to time by the appropriate authorities of the University. Any student, in accepting admission, indicates willingness to subscribe to and be governed by these rules and regulations and acknowledges the right of the University to take such disciplinary action, including suspension and/or expulsion, as may be deemed appropriate, for failure to abide by such rules and regulations or for conduct adjudged unsatisfactory or detrimental to the University.

The Divinity School expects its students to participate in a communally shared concern for growth in life appropriate to Christian faith and to the dignity of their calling.

Community Life



Corporate Worship

One of the most important aspects of a program of training for Christian life is a vigorous, inspiring, and varied program of participation in corporate worship. This corporate life of the Divinity School is centered in York Chapel where services are held weekly. These services are led by members of the faculty, members of the student body, and guests. Services are voluntary but have been and will continue to be sources of inspiration and strength to the members of the community.

Living Accommodations

Town House Apartments. Duke University operates Town House Apartments primarily for graduate and professional school students. Others may be housed if vacancies exist. The setting of these apartments provides single graduate students a comfortable, home-like atmosphere free of all aspects of living inherent to residence halls. Sixteen of the thirty-two air-conditioned apartments are equipped for two students, and the remaining sixteen units are equipped for three students.

Central Campus Apartments. Duke University operates a 500-unit housing facility known as Central Campus Apartments. The complex provides basic housing for married graduate students, and single and married students in nondegree allied health programs. Assignments are made on a first-apply, first-assigned basis.

For single students one-bedroom and two-bedroom apartments are fully furnished. The apartments for married students include a few efficiencies and a number of one-, two-, and three-bedroom units in which the kitchen, living room, and first bedroom are basically furnished. These apartments are equipped in such a way as to provide economy and convenience to eligible married students while allowing for individuality.

Off-Campus Housing. The Department of Housing Management maintains lists of rental apartments, rooms, and houses provided by Durham property owners or real estate agents who will agree not to discriminate in the rental property because of race, sex, creed, or nationality of a prospective tenant. These lists are available in the Central Campus office. Off-campus rental properties are not inspected or approved, nor does the University or its agents negotiate with owners for students, faculty, or staff.

Application Procedures. When students are informed of their acceptance to the Divinity School, they will also receive a form on which to indicate their preference for University housing. This form should be returned to the Department of Housing

Management. Detailed information on the types of accommodations, and application forms, will be forwarded to the accepted student. However, if additional information is desired prior to a student's acceptance, please write to the Department of Housing Management, Duke University, Durham, North Carolina 27706.

Food Services. Food service facilities located throughout the Duke campus include both board plan and cash operations. Graduate and professional students are welcome to eat in any of the board plan cafeterias at guest meal prices or they may participate voluntarily in any of the point plans. Details are available from the Food Services Business Office, 106 West Campus Union Building. Board plans in the Blue and White Room Cafeteria and the East Court Cafeteria provide participants and their guests with unlimited seconds-style meals throughout the week at set prices. Dining facilities on the West Campus include a cafeteria with multiple-choice menus, the Oak Room with table service, and the Cambridge Inn with fast foods and beverages. The Bryan Center has a snack bar and a Rathskeller, both open all week, morning through late evening. East Campus has cafeteria service and a snack bar. Trent Drive Hall has a public cafeteria and Gradelí's, a snack bar/delicatessan. The Sprout is a salad and soup bar open for lunch Monday through Friday. Duke University Food Services is the largest student employer on campus, and hires students in almost every food operation. A listing of open positions and areas is available from the Personnel Office, 106 West Campus Union Building.

Student Health

One of the prerequisites for gaining the most from the University experience is a sense of well-being. The aim of the University health service is to provide medical care and health advice necessary to help the student enjoy being a part of the University community. To serve this purpose, both the University health service clinic and the University infirmary are available for student health care needs. A separate fee for this service is assessed.

The main components of the health service include the University health service clinic, located in the Pickens Building on West Campus, and the University infirmary on the East Campus. Emergency transportation, if required, can be obtained from the Duke campus police. Residential staff personnel should be consulted whenever possible for assistance in obtaining emergency treatment.

The facilities of the University health service clinic are available during both regular and summer sessions to all currently enrolled full-time students. The facilities of the University infirmary are available during the regular sessions from the opening of the University in the fall until graduation day in the spring to all currently enrolled full-time students.

The University has made arrangements for a student accident and sickness insurance plan to cover all full-time students for a twelve-month period. For additional fees a student may obtain coverage for a spouse or spouse and child. Although participation in this program is voluntary, the University expects all graduate students to be financially responsible for medical expenses above those covered by the University student health program through the University accident and sickness policy, a private policy, or personal financial resources. Students who have equivalent medical insurance or wish to accept the financial responsibility for any medical expense may elect not to take the Duke plan by signing a statement to this effect. Each full-time student in residence must purchase this student health insurance or indicate the alternative arrangement. The student accident and sickness insurance policy provides protection twenty-four hours per day during the full twelve-month term of the policy for each student insured. Students are covered on and off campus, at home, or while traveling between home and school and during interim vacation periods. Term of the policy is from opening day in the fall. Coverage and services are subject to change each year

as deemed necessary by the University in terms of costs and usage.

Since the student health program does not cover students while away from the Duke campus, it is imperative that student pastors and assistant pastors (winter and/or summer) who are subjected to the hazards of highway travel with great frequency secure complementary health and accident insurance for the full twelve-month period. Students whose course load entitles them to full coverage under the student health program are eligible to secure a complementary insurance policy through the University which provides protection for the entire calendar year. Costs and details of the complementary policy are available from the Director of Admissions and Student Affairs. At the time of registration, a student *must* enroll in this complementary insurance program or sign a waiver of liability statement regarding health care and claims. Students in internship programs carrying less than two courses in any given semester are strongly encouraged to apply for this insurance. Foreign students are required to hold this or another acceptable policy.

All full-time and part-time degree candidate students are required to enroll in the Student Accident and Sickness Insurance Policy unless they show evidence by completing the appropriate waiver statement contained on the remittance form of the University invoice indicating that they are covered by other generally comparable insurance. This statement requires that the name of the insurance company and the policy number be indicated as well as the signature of the student or parent. Also, note this requirement may be waived by signing the appropriate space on the University invoice indicating willingness to assume the medical costs of any sickness or accident.

Married students are expected to be financially responsible for their dependents, providing for hospital, medical, and surgical care, since their dependents are not covered at any time by student health.

The resources of the Duke University Medical Center are available to all Duke students and their spouses and children. Charges for any and all services received from the Medical Center are the responsibility of the student as are the charges for services received from physicians and hospitals not associated with Duke University.

Counseling and Psychological Services. Counseling and Psychological Services (CAPS) is a component of student services which provides a coordinated, comprehensive range of counseling and developmental services to assist and promote the personal growth of Duke students. The professional staff is composed of psychologists, clinical social workers, and psychiatrists experienced in working with young adults. They provide evaluation and brief counseling/psychotherapy regarding a wide range of concerns, including such issues as self-esteem and identity, family relationships, academic performance, dating, intimacy, and sexual concerns. While students' visits with counselors are usually by appointment, a walk-in consultation service is provided two hours each weekday for students with urgent personal concerns.

Each year CAPS offers a series of self-development seminars focusing on skills development and special interests. These explore such interests as stress management, assertiveness training, career planning, couples' communication, and study skills. Interested students may call or come by CAPS for further information.

As Duke's center for administration of national testing programs, CAPS also offers a wide variety of graduate/professional school admission tests and professional licensure and certification examinations. The staff is also available to the entire University community for consultation and educational activities in student development and mental health issues affecting not only individual students but the campus community as a whole. They work with campus personnel, including administrators, faculty, student health staff, religious life staff, resident advisers, and student groups, in meeting needs identified through such liaisons. Staff members are available to lead workshops and discussion groups on topics of interest to students.

CAPS maintains a policy of *strict confidentiality* concerning information about each student's contact with the CAPS staff. If a student desires that information be released to anyone, written authorization must be given by the student for such release.

There are no charges for initial evaluation, brief counseling/psychotherapy, or self-development seminars. If appropriate, referral may be made to other staff members or a wide variety of local resources.

Appointments may be made by calling 684-5100 or coming by the office in 214 Old Chemistry Building, West Campus, between 8:00 A.M. and 5:00 P.M. Monday through Friday. If a student's concern needs immediate attention, that should be made known to the secretary, and every effort will be made to arrange for the student to talk with a staff member at the earliest possible time.

Motor Vehicles

Each student possessing or maintaining a motor vehicle at Duke University must register it at the beginning of the academic year in the security office at 2010 Campus Drive. If a motor vehicle is acquired and maintained at Duke University after academic registration, it must be registered within five calendar days after operation on the campuses begins. Resident students are required to pay an annual fee of \$20 for each motor vehicle or \$10 for each two-wheeled motor vehicle. Students first registering after 1 January are required to pay \$14 for a motor vehicle or \$7 for a two-wheeled motor vehicle.

At the time of registration of a motor vehicle, the following documents must be presented: the state vehicle registration certificate, a valid driver's license, and satisfactory evidence of automobile liability insurance coverage with limits of at least \$10,000 per person and \$20,000 per accident for personal injuries, and \$5,000 for property damage, as required by the North Carolina motor vehicle law.

If a motor vehicle or a two-wheeled motor vehicle is removed from the campus permanently and the decal is returned to the traffic office prior to 1 January there will be a refund of \$10 for a motor vehicle and \$5 for a two-wheeled motor vehicle.

Student Activities and Organizations

In the absence of common living and dining accommodations, community life in the Divinity School centers around a number of organizations and activities. The richness of life prevents more than a very selective listing of activities and organizations.

A primary center for community is a morning chapel service held every Tuesday, Wednesday, and Thursday in York Chapel while school is in session. Faculty and students share joint responsibility for these services.

A number of students find both intimacy and fellowship in one of several informal groups whose major purpose is to provide students with opportunities to express and share personal, professional, and spiritual developments with each other in weekly meetings on the campus and at home.

The Community Life Committee of the Student Representative Assembly annually plans at least six community-wide events for students and faculty. Weekend retreats present students with an opportunity to become better acquainted with each other and with faculty, and to explore matters of personal, professional, or spiritual concern. Dialogues on ministry occurring through the year help introduce students to practicing ministers and their personal, professional, and spiritual struggles and growth.

The Student Association. The officers of the Student Association are elected and serve as an executive committee for conduct of the business of the Representative Assembly.

The purpose of the association is to channel the interests and concerns of Divinity School students to the following ends:

1. to provide student programs and activities;
2. to represent students to the faculty and administration;
3. to represent students with other Duke University organizations; and
4. to represent students in extra-University affairs.

Divinity School Choir. A student organization of long standing is the Divinity School Choir. Membership is open to all qualified students. The choir sings regularly for chapel and at special seasonal programs and services. New members are chosen by informal auditions which are arranged for all who are interested.

Divinity Spouses. Divinity Spouses is an organization which offers the spouses of regularly enrolled students opportunities for sharing interests and concerns. The spouses' program, which includes topical monthly meetings with a variety of speakers, small interest groups, and special projects, seeks to encourage and provide ways for spouses to become a more integral part of the Divinity School community. Monthly meetings are open to all persons. A favorite event each year is a progressive dinner for couples involving the visitation of a number of faculty homes.

The Black Seminarians' Union. This is an organization of black students whose major purpose is to insure the development of a theological perspective commensurate with the Gospel of Jesus Christ and relevant to the needs of black seminarians and the black church, to improve the quality of life academically, spiritually, politically, and socially in the Divinity School.

The Student Pastors' Association. This association provides students actively serving their denominations in an ordained or lay capacity opportunity to meet, to share, to plan, and to act on their common needs and concerns as those serving the church as senior and associate pastors while in school.

Women's Center. The Women's Center seeks to serve the entire Divinity School community through a focus on the special needs and contributions of women in ministry in and to the Church and society today. The office, coordinated by two divinity women students, is a resource center for the whole community in addition to a support and action center for women in particular.

Theological Students' Fellowship. This organization provides fellowship, scholarship resources, and weekly prayer groups for all students interested in the evangelical tradition. Evening meetings with dinner, singing and prayer, a weekly sharing group at the school, and a monthly lecture series provide integration of academic and spiritual aspects of seminary life.

Financial Information



Fees and Expenses

Estimated Living Expenses. The total cost for a student to attend the Duke Divinity School varies according to individual tastes and requirements; however, experience indicates that a single student may expect to spend a minimum of \$8,225 for nine months and a married couple may expect to spend a minimum of \$12,775 for twelve months.

Housing Fees. Estimated minimal on-campus housing cost for a single student will be approximately \$1,904 during 1983-84. An efficiency apartment for a married couple on campus will cost approximately \$354 per month for the academic term.

Housing fees are subject to change prior to the new academic year. A \$100 deposit is required on all reservations.

Rates for Central Campus Apartments will be quoted to applying students upon request to the manager of apartments and property. Refunds on housing fees will be made in accordance with the established schedules of the University.

Master of Divinity and Master of Religious Education Candidates. The table below lists basic minimum expenditures. In addition to the fees cited here, there is an admission fee of \$50 which is applied to the first term bill and a room deposit of \$50. See relevant sections on admissions and housing for full details.

	<i>Per Semester</i>	<i>Per Year</i>
Tuition—M.Div. and M.R.E.	\$1,910	\$3,820
Student Health Fee	92	184
Approximate Cost of Meals	850	1,700

Tuition will be charged at the rate of \$477.50 per course. The figures shown are for a program carrying eight courses per year. Students will be charged for additional course enrollments.

Master of Theology Candidates. A student who is a candidate for the Th.M. degree will be liable for tuition on the basis of eight courses at the rate of \$477.50 per course. All other costs and regulations for the Th.M. degree are the same as those for the M.Div. and M.R.E. degrees. Th.M. students are not ordinarily eligible for student financial aid.

Special Student. A special student is one who is enrolled for academic credit, but who is not a candidate for a degree at that time. The tuition will be charged on a course basis. Other costs and regulations are the same as those for the M.Div. and M.R.E. candidates. No financial aid is available.

Audit Fee. Anyone seeking to audit a course in the Divinity School must, with the consent of the instructor concerned, secure permission from the Associate Dean's office. In accordance with the general University practice, a fee of \$85 per course will be charged all auditors who are not enrolled as full-time students or University employees.

Athletic Fee. Divinity School students may secure admission to all regularly scheduled University athletic contests held on the University grounds during the entire academic year by payment of the athletic fee of \$50 per year plus any federal tax that may be imposed. The fee is payable in the fall semester.

Payment and Penalty. Monthly invoices for tuition, fees, and other charges will be sent by the Bursar's office which are payable by the invoice due date; no deferred payment plans are available. As a part of the agreement of admission to Duke University a student is required to pay all invoices as presented. If full payment is not received, a late payment charge as described below will be assessed on the next invoice and also certain restrictions as stated below will be applied.

If payment in the amount of the total amount due on the student invoice is not received by the invoice due date, a penalty charge will be accrued from the billing date of the invoice. The penalty charge will be at a rate of 1½ percent per month (16 percent per annum) applied to the past due balance on the student invoice. The past due balance is defined as the previous balance less any payments and credits received during the current month and also any student loan memo credits, related to the previous balance, which appear on the invoice.

An individual will be in default of this agreement if the total amount due on the student invoice is not paid in full by the invoice due date. An individual who is in default will not be allowed to register for classes, receive a transcript of academic records, have academic credits certified, be granted a leave of absence, or receive a diploma at graduation. In addition, an individual in default may be subject to withdrawal from school.

Refunds of tuition and fees are governed by the following policy:

In the event of death a full tuition and fees refund will be granted.

In all other cases of withdrawal from school or withdrawal from one or more courses, tuition will be refunded according to the following schedule: withdrawal before the opening of classes—a full refund; withdrawal during the first or second week—80 percent; withdrawal during the third through fifth week—60 percent; withdrawal during the sixth week—20 percent; withdrawal after the sixth week—no refund.

A student may reduce the number of courses for which he or she has registered for an appropriate reason with the approval of the Associate Dean for Curricular Affairs. If a student receives permission to drop one or more courses, tuition will be refunded according to the following schedule: during the first or second week of the semester—100 percent; during the third through fifth week—60 percent; during the sixth week—20 percent; after the sixth week—no refund.

Tuition or other charges paid from grants or loans will be restored to those funds on the same prorate basis and will be refunded to the student or carried forward.

These regulations apply to all Divinity School students—degree candidates, special students, and auditors.

Debts. No records are released, and no students are considered by the faculty as candidates for graduation, until they have settled with the Bursar for all indebtedness. Bills may be sent to parents or guardians provided the Bursar has been requested in writing to do so. Failure to pay all University charges on or before the times specified by the University for the semester will bar the student from class attendance until the account is settled in full.

Motor Vehicle Registration Fee. There is a \$20 registration fee for all automobiles (\$10 for two-wheeled motor vehicles) used on campus. For specifics see the chapter "Community Life."

Student Financial Aid

A student should select a school on the basis of educational opportunity. At the same time financial consideration will be a legitimate and often pressing concern. Each student should formulate at least a tentative plan for financing the entire seminary education. Although the exact method of financing the full theological degree may not be assured at the beginning, a student should have a clear understanding of the expenses and available sources of income for the first year and the assurance that there exist ways of financing subsequent years.

The Committee on Financial Aid will counsel the student concerning financial needs and possible resources. There is constant review of available resources in order to assist the greatest number of students. However, the basic financial responsibility belongs to the student who is expected to rely upon personal and family resources and earning and borrowing power. Other resources may include the student's church, civic groups, foundations, and resources of the school which may include grants, loans, field education grants, and employment. It is the goal of the financial aid office to assist each student in planning a financial program so that as little indebtedness as possible will be incurred.

The total amount available through the Divinity School is limited. Further, the conditions set forth by the individual or institutional donors determine the circumstances under which the grants can be made. Almost without exception the donors require ecclesiastical endorsement and/or declaration of ministerial vocational aim.

The principles regarding the disbursement of financial aid are as follows:

1. Financial aid is recommended on the basis of demonstrated need. All students must file an application which substantiates needs and provides full information on potential resources. This is essential in order to make Divinity School funds available to the greatest number of students.
2. The total amount of financial aid available to any one student cannot exceed the average demonstrated need.
3. Grants will be made within the limits of the conditions set forth governing each source.
4. The conditions at the beginning of the academic year determining financial needs shall be the governing criteria for the year. Financial aid programs are set up on a yearly basis, except for those students who may enter the second semester and/or those few whose status may change.
5. Financial aid grants are made on a one-year basis. The assistance may consist of scholarships, loans, tuition grants, grants-in-aid, field education grants, and employment, which may be worked out in various combinations on a yearly basis. A new application must be filed each year.
6. Application for financial aid may be made by entering students at time of admission or currently enrolled students by 1 December. Notification will be given after committee approval. Student pastors serving United Methodist churches can be notified after the pastoral charge and Annual Conference determine salary schedules. Financial aid applications for students anticipating fall matriculation are reviewed beginning in mid-February. Applications for assistance will not be accepted after 1 June for September enrollment or after 15 December for January enrollment.
7. Ordinarily financial aid is not available beyond six semesters (eight for pastors on reduced load).

8. Students who have questions about the Divinity School's response to their financial aid request should first speak with the financial aid secretary. Where desired, students may file an appeals form for full review by the financial aid appeals committee.
9. Special students and Th.M. students (with the exception of one international scholar annually) are not eligible for any form of financial assistance from the Divinity School. Th.M. students are eligible to apply for denominational and federal loans.

Financial Resources

Personal. In order that both the church and the Divinity School may be able to extend the use of their limited funds to as many students as possible, a student who desires a theological education should be willing to defray as far as possible the cost of such an education. Resources may include savings, earnings, and gifts, support or loans, and if married, earnings of a spouse. In calculating anticipated income, the student first considers personal resources.

Church. Many local churches and conferences or other governing bodies provide gifts and grants for theological education, such as ministerial education funds which provide grants and/or service loans to theological students. The student makes application to the home church, Annual Conference, Presbytery, or other governing body. The financial aid office cooperates with these church agencies in making recommendations and in handling the funds. *United Methodist students and others must be under the care of the appropriate church body to be eligible for church support.* The school cannot compensate for a student's indisposition to receive church funds when such are available on application through the Annual Conference Ministerial Education Fund or other agencies.

The Divinity School, as a member school of the Association of United Methodist Theological Schools, takes cognizance of and subscribes to recommended policy and practice regarding the administration of United Methodist Church funds for student financial aid as adopted by the association, 1 June 1970, and as bearing upon tuition grants, as follows:

Resources for tuition grants, scholarships or the like are primarily available to students with declared vocational aims leading to ordination or recognized lay ministries and supported by commendation or endorsement of appropriate church representatives. At the same time, we believe that consideration for a tuition grant may be accorded to students who adequately indicate conscientious concern to explore, through seminary studies, a recognized church-related vocation. Finally, it is our judgment that, where the above-mentioned conditions are deemed to be absent respecting a candidate for admission, the decision to admit such a candidate should be without the assurance of any tuition subsidy deriving from church funds. (*AUMTS Minutes*, 1 June 1970.)

Divinity School Scholarships. A limited number of scholarships are available to encourage qualified students to pursue their preparation for the Christian ministry.

Scholarships for Academic Merit. Each year the Divinity School awards ten scholarships to entering junior students on the basis of academic excellence in their undergraduate programs and promise for Christian ministry. The specific amount of a scholarship for academic merit will depend upon a student's demonstrated financial need and will not exceed a maximum \$3,000.

Ten scholarships for academic merit are given for the middle and senior years of study on the basis of class standing, i.e., the top ten achievers in each class receive the scholarships. The scholarships pay up to \$2,500 each, depending upon a student's demonstrated financial need.

The Dean's Scholarship. The Dean's scholarships will be awarded to at least ten recipients each year. These persons must represent strong promise for Christian



ministry, academic achievement, and demonstrated financial need. Factors which will be taken into account are ethnic origin, missional responsibilities for the Church at home and abroad, and special denominational needs. The specific amount of the scholarship will be based upon demonstrated need and may go up to \$2,500 per year. The scholarship is renewable for two years assuming continued academic attainment, development of ministerial promise, and demonstrated financial need.

International Student Scholarships. In cooperation with the Crusade Scholarship Committee of the United Methodist Church and other authorized church agencies, students are selected and admitted to courses of study. Scholarships for such students are provided from the Lewis Clarence Kerner Scholarship Fund and from individual churches and private philanthropy.

Tuition Grants. These are available in amounts commensurate with demonstrated need as adjudged by the Committee on Financial Aid. Entering students may apply, on notice of admission, by submitting the financial aid application to the Office of Financial Aid. Enrolled students may apply by annual renewal of their financial aid request. Because of the purpose and attendant educational objectives of the school, resources for tuition grants are primarily available to students with declared aims leading to ordination or recognized lay ministries.

Field Education Grants. Varying amounts are made available through the Divinity School to students who choose to participate in the field education program. The Offices of Field Education and Financial Aid work together in determining placement and grant amount. This program includes the summer assistants, winter assistants, and student pastors. See full description under the section on field education.

Duke Endowment Student Pastor Grants. United Methodist students serving under episcopal appointment as student pastors in the state of North Carolina may qualify for tuition assistance up to \$1,600 through the Duke Endowment. The Financial Aid Committee will determine student eligibility for such assistance after appointments are read at the meetings of the two North Carolina United Methodist Annual Conferences.

Loans. Loan funds held in trust by the University, as well as United Methodist student loans and funds supplied by the federal government through the National Defense Education Act of 1958 are available to qualified students. The application must be submitted by 1 July.

Unless otherwise indicated, all correspondence concerning financial aid should be directed to: Financial Aid Office, The Divinity School, Duke University, Durham, North Carolina 27706.

Employment. Students or spouses desiring employment with the University should apply to the Director of Personnel, Duke University. Students or spouses make their own arrangements for employment either in the city of Durham or on campus.

Special Funds

Certain special funds have been established, the income from which is used to provide financial aid through scholarships and field education grants for students wishing to secure training in preparation for Christian ministry. The resources listed below include endowed funds and funds which have a variety of purposes.

Alumni Scholarship Fund. This fund was established in 1976 by the alumni of the Divinity School to provide financial support for ministerial candidates.

R. Ernest Atkinson Legacy. This legacy was established in 1952 under the will of the Reverend R. Ernest Atkinson, Trinity College Class of 1917, Richmond, Virginia.

M. M. Brabham Scholarship and Loan Fund. This fund was established in 1981 by Sara K. Brabham in memory of her father, the Reverend Mathew Moye Brabham; her mother, Fannie Cannon Brabham; and her sisters, Maud Brabham and Mary Moey Brabham. The fund is administered on behalf of St. Paul United Methodist Church, Ninety-six, South Carolina.

Fred W. Bradshaw Fund. This fund was established by Fred W. Bradshaw of Charlotte, North Carolina, to be utilized for the enrichment of the educational program of the Divinity School, especially to support distinguished visiting scholars and outstanding students.

Emma McAfee Cannon Scholarship. This scholarship was established in 1969 by Bishop William R. Cannon in memory of his mother, Emma McAfee Cannon, and is designated to assist students from the North Carolina Annual Conference of the United Methodist Church who are studying for the pastoral ministry and planning to spend that ministry in the North Carolina Conference.

James T. Cleland Endowment Fund. This fund was established by friends and students of James T. Cleland to create a Chair of Preaching in his honor. He was Dean of the Duke University Chapel from 1955 to 1973 and Professor of Preaching in the Divinity School.

E. M. Cole Fund. This fund was established in 1920 by Eugene M. Cole, a United Methodist layman of Charlotte, North Carolina.

Lela H. Coltrane Scholarship. This scholarship was established in 1980 by Mrs. David S. Coltrane of Raleigh, North Carolina, and friends of Mrs. Coltrane.

Robert Earl Cushman Endowment Fund. This fund was established in 1980 to create a professorship in honor of Robert Earl Cushman, Dean of the Divinity School, 1958–1971.

Dickson Foundation Awards. These awards were established by the Dickson Foundation of Mount Holly, North Carolina, to provide assistance to students who demonstrate financial need and superior ability. Preference is given to children of employees of American and Efird Mills and its subsidiaries; to residents of Gaston, Caldwell, and Catawba Counties; and to North Carolinians.

The Duke Endowment. Among the beneficiaries of the Duke Endowment, established in 1924, are the rural United Methodist churches of the two North Carolina Conferences. Under the Maintenance and Operation Program, Field Education Grants are available for Duke Divinity School students to serve in rural United Methodist churches under the Endowment and Field Education Program.

Henry C. Duncan Fund. The Village Chapel in Pinehurst, North Carolina, established this fund in 1982 in honor of its pastor, Chaplain Henry C. Duncan, a member of the Divinity School Class of 1949.

N. Edward Edgerton Fund. This fund was established in 1939 by N. Edward Edgerton, Trinity College Class of 1921, of Raleigh, North Carolina.

Will Ervin Scholarship Fund. An endowment established by Will Ervin in 1980 and administered by the Richlands United Methodist Church provides support for students preparing for Christian ministry.

George D. Finch Scholarship Fund. This fund was established in 1972 by George David Finch, Trinity College Class of 1924, of Thomasville, North Carolina.

W. Kenneth and Martha O. Goodson Fund. This fund was established in 1981 to honor Bishop Goodson, retired Bishop of the United Methodist Church, and Mrs. Goodson.

James A. Gray Fund. In 1947 James A. Gray of Winston-Salem, North Carolina, presented this fund to the Divinity School for use in expanding and maintaining its educational services.

P. Huber Hanes Scholarship. This scholarship was established by the late P. Huber Hanes of Winston-Salem, North Carolina, Trinity College Class of 1900, as a scholarship fund for Duke University, a portion of which is used to provide financial assistance for Divinity School students.

Richard R. Hanner, Jr. Scholarship. This scholarship was established in 1973 by friends of the late Richard R. Hanner, Jr., Trinity College Class of 1953, to support advanced work in Christian education.

Russell S. and Julia G. Harrison Scholarship Fund. This fund was established in 1980 by Russell S. Harrison, Divinity School Class of 1934, and his wife Julia G. Harrison. The income is for support of persons from the North Carolina Conference of the United Methodist Church preparing for ordained ministry as local church pastors.

Margaret Blount Harvey Fund. This fund was established in 1982 by C. Felix Harvey and Margaret Blount Harvey of Kinston, North Carolina.

Hebrew Evangelization Society Scholarship. The Hebrew Evangelization Society, Inc., founded in 1931 by Dr. A. U. Michelson, provides two full-tuition scholarships each year.

Franklin Simpson Hickman Memorial Fund. This fund was established in 1966 by Mrs. Veva Castell Hickman as a memorial fund in memory of her husband, who

served as Professor of the Psychology of Religion, the Dean of the Chapel of Duke University, and the first preacher to the University. The income of the fund will support a regular visiting lecturer in preaching and financial aid to students who wish to specialize in the psychology of religion.

George M. Ivey Scholarship Fund. This fund was established in 1948 by a gift of George M. Ivey, Trinity College Class of 1920, of Charlotte, North Carolina.

George Washington Ivey Professorship. With initial funding by the Western North Carolina Conference of the United Methodist Church and later funding by George M. Ivey, George M. Ivey, Jr., Leon Ivey, and the Ivey Trust, the George Washington Ivey Chair is the oldest named professorship in the Divinity School.

Charles E. Jordan Scholarship Fund. This fund was established in 1969 by the family of Charles E. Jordan, former Vice-President of Duke University.

Amos Ragan Kearns Professorship. A gift from the late Amos Ragan Kearns was designated to establish a Chair in Religion.

Lewis Clarence Kerner Scholarship. This fund was established in 1959 by Beatrice Kerner Reavis of Henderson, North Carolina, in memory of her brother and designated for the assistance of native or foreign-born students preparing for service in world Christian mission.

Carl H. and Mary E. King Memorial Fund. This fund was established in 1976 by friends and family and is to be used for students preparing for the parish educational ministry.

Thomas A. and Ann Marie Langford Fund. This fund was established in 1981 in honor of Dr. Thomas A. Langford, Dean of the Divinity School, 1971–81, and Mrs. Langford.

Laurinburg Christian Education Fund. This fund was established in 1948 by members of the First United Methodist Church, Laurinburg, North Carolina.

John Joseph Lewis Fund. This fund was established in 1982 by Mario Smith Lewis of Charleston, South Carolina.

Dr. D. M. Litaker Scholarship. This scholarship was originally established by Charles H. Litaker in 1946 in honor of his father, Dr. D. M. Litaker, Trinity College Class of 1890, and was specified for the Divinity School in 1977 by the Litaker family. The income is for support of persons preparing for ministry in the Western North Carolina Annual Conference of the United Methodist Church.

Robert McCormack Scholarship. This fund was established by the Trustees of the Duke Endowment to honor Robert McCormack, Chairman of the Board of the Duke Endowment at the time of his death in 1982.

Myers Park Scholarship Fund. This fund was established in 1948 by members of the Myers Park United Methodist Church, Charlotte, North Carolina.

W. Fletcher Nelson Scholarship. This fund was established in 1980 by friends of W. Fletcher Nelson, Duke Divinity School Class of 1930, of Morganton, North Carolina.

W. R. Odell Scholarship. This scholarship was established in 1946 by the Forest Hills United Methodist Church, Concord, North Carolina.

The Parish Ministry Fund. This fund was established in 1968 to provide continuing education opportunities for selected parish ministers and lay leaders from the Western North Carolina Conference of the United Methodist Church. The fund sponsors seminars, short study courses, and takes special grants for full-time study leaves.

The program is administered by the Divinity School under the direction of the Parish Ministry Fund's Board of Directors.

Cornelius Miller and Emma Watts Pickens Memorial. This fund was initiated in 1966 by the Pickens brothers to honor their parents. Income provides assistance to the Divinity School Media Center.

William K. Quick Endowment Fund. This fund was begun in 1981 by Mr. and Mrs. Stanley S. Kresge to establish a Chair in Methodist Studies to be named for their pastor, William Kellon Quick, member of the Divinity School Class of 1958.

Gilbert T. Rowe Memorial Scholarship Fund. This fund was established in 1960 through the generosity of Divinity School alumni and friends of the late Professor of Systematic Theology.

Elbert Russell Scholarship. This scholarship was established in 1942 by the Alumni Association of the Divinity School in honor of the late Dean of the Divinity School and Professor of Biblical Theology.

Hersey E. and Bessie Spence Fund. A gift from the estate of Hersey E. and Bessie Spence was designated to establish a Chair in Christian Education.

Hersey E. Spence Scholarship. This scholarship was established in 1947 by the Steele Street United Methodist Church of Sanford, North Carolina, in honor of their former pastor and late professor in the Divinity School.

David Johnson and Mary Woodson Sprott Fund. This fund was established in 1982 by David Johnson Sprott of Winter Park, Florida.

Earl McCrary Thompson Scholarship. This scholarship was established in 1974 in honor of the late Earl McCrary Thompson, Trinity College Class of 1919.

The United Methodist Church. The United Methodist Church makes a substantial contribution to the Divinity School by designating a percentage of its Ministerial Education Fund and World Service Offerings for theological education. The general Board of Education makes available annually two national United Methodist Scholarships having a cash value of \$750 each.

The Divinity School Fellowship. This fellowship was established by a group of interested laypersons who provide support for students with demonstrated need.

Dempster Graduate Fellowships. The United Methodist Board of Education offers two fellowships each year for graduates of United Methodist theological schools who are engaged in programs of study leading to the Ph.D. degree in religion. A number of Divinity School graduates have held these fellowships.

CENTER FOR STUDIES IN THE WESLEYAN TRADITION

The resources of this fund are used for teaching, research, and special projects to enhance exploration of and dissemination about the ecclesiastical tradition initiated by John Wesley.

Field Education



A Ministerial Development Program

As the clinical dimension of theological education, field learning is designed to: (1) help students develop vocational identity as ministers by providing experience with a variety of ministry tasks; (2) provide a ground for the testing and reconstruction of theological concepts; (3) develop the ability to do critical and reflective thinking by relating theory and experience; (4) help students develop ministry skills to achieve an acceptable level of professional competence; (5) integrate academic studies, personal experiences, and critical reflection into a personal spiritual foundation that produces a confident and effective ministry.

Field Education Credit Requirements

Two units of approved field education placement are required for graduation in the Master of Divinity degree program. A unit is defined by one term placement, either a summer term of ten weeks or a winter term of thirty weeks at fifteen hours per week. To be approved, the field setting must provide ministerial identity and role, distinct ministerial tasks, qualified supervision, a service-learning covenant, regular supervision conferences, and effective evaluation. Each unit also requires completion of the appropriate field education seminar concurrent with or immediately following the field placement.

The seminar required for each unit of credit will include the use of case material prepared by the student and critical reflection upon the nature and task of ministry as it is experienced in an approved field setting. Seminars will be led by faculty and ministers. The field seminars must be taken in sequence: FE I, Ministerial Development Seminar, must be *completed* by the end of the third semester of study and is prerequisite to FE II, Ministerial Practice Seminar, taken during one of the last two semesters of study. One unit of clinical pastoral education may be substituted for FE I. Students must be enrolled in the school and have full-time status to be eligible for credited field seminars.

To qualify for credit the student must apply and be approved for a credited placement, develop and complete a learning covenant with acceptable quality of work, cooperate with the supervisor, participate in the assigned seminar, and prepare an evaluation of the experience. Evaluation and grading will be done by the field supervisor, student, and seminar leader.

Administering Ministerial Development

Development of ministerial competency is the responsibility of each student. If the Assistant Dean for Field Education questions a student's readiness for field assignment, a committee consisting of the student's faculty adviser, a member of the Field Education Committee, and the Assistant Dean will assess the student. Divinity School admission materials, evaluation by the Assistant Dean, and if necessary, additional professional evaluation will be used. This committee will approve field assignment, or refer the student to remedial avenues of personal and professional development, including, if necessary, a leave of absence or withdrawal from school. Such action will be referred to the Academic Standing Committee for inclusion in assessment of that student's progress towards graduation.

Field Settings for Ministry Development

Field placements are usually made in settings that have been developed and approved by the Divinity School. They offer opportunities for ministerial service with supervision, pastoral identity, and evaluation.

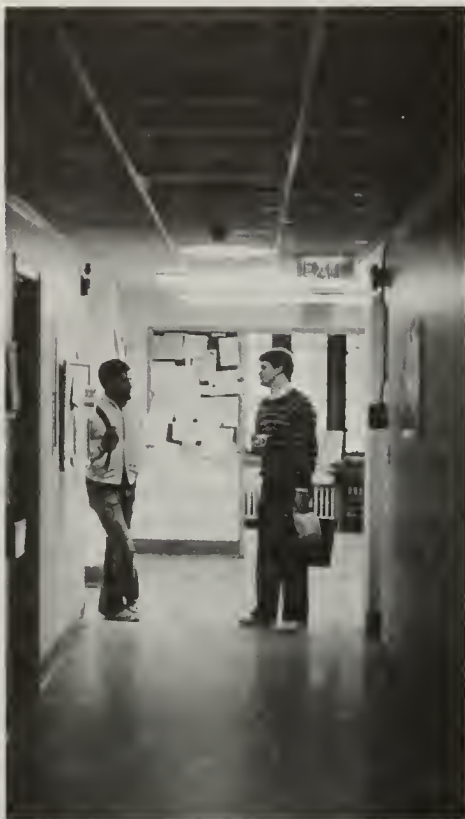
A wide variety of ministry settings is available for varying student interests: parish settings include rural, suburban, central urban, cluster groups, larger parish patterns, and staff team ministries; institutional settings include mental health institutions, prisons, youth rehabilitation centers, mental retardation centers, and retirement homes; campus ministry settings include positions on the campuses of a variety of schools as well as internships in college teaching.

While the Divinity School offers this rich diversity of settings for personal and ministerial development, the large majority of assignments fall in local churches in small communities. Because of the Divinity School's ties with the United Methodist Church, most field placements occur in that tradition. However, the Divinity School will do everything possible to see that each student completes at least one assignment in his or her own denominational tradition.

Internship Program

An internship assignment embraces both a full-time salaried position and a learning commitment in a single context over a period of time ranging from four to twelve months. These assignments are designed to engage the student in considerable depth in particular ministry skills in a setting relevant to the vocational area of interest. They must encompass an advanced level of specialized field experience which is more complex and extensive in its serving and learning potential than the basic field education short-term placement. The internship may be individually designed to meet the needs and interests of the student, provided that the plan includes a student learning covenant, an agency service contract, approved supervisory standards, an investigation-research project acceptable to the assigned faculty adviser, and participation in either a colleague group or seminar. When these components are satisfactorily met and the evaluation reports are filed, credit for up to two courses (six semester hours) may be assigned for the internship. No additional academic credit may be accumulated during the internship year. Grading for the two course credits will be on a pass/fail basis.

Internship settings may be student-initiated or negotiated by the school. In either case an agency contract covering all agreements must be made and filed with the Assistant Dean for Field Education. Types of settings occasionally available for internship placement include: campus ministry and college chaplaincy positions; parish ministry positions—such as associate pastor, parish director of education; institutional positions; and a world mission internship of one to three years of national or overseas service. Other internships in the church or in specialized ministries in the secular world may be planned in consultation with the Assistant Dean.



To be eligible to register for an internship, the student must have completed at least one-half of his or her degree program and be registered as a student in good standing in the Divinity School. Application forms and processing for internships will be done through the Office of Field Education.

Students Serving As Pastors

Students frequently serve as pastors of churches, or part-time associates, during the period of their study in the Divinity School. These appointments are made by the appropriate denominational official or body. The Divinity School recognizes this arrangement and recommends that the student consult with the Assistant Dean for Field Education, as agent of the Dean, before accepting an appointment as pastor or associate pastor.

The field education office cannot make these appointments. This is within the jurisdiction of denominational authorities, and students should initiate their own arrangements. The field education office, however, will provide current information concerning pastoral appointments open to students and will send references upon request to ecclesiastical officials.

Students who serve in these capacities ordinarily may enroll in no more than three courses per semester, thus requiring, in most cases, eight semesters to complete the Master of Divinity degree. Relaxation of this regulation requires the permission (on the appropriate form) of the supervising church official, the Assistant Dean for Field Education, and the Associate Dean for Curricular Affairs. Students are strongly and actively discouraged from attempting to commute more than fifty miles one way on a daily basis. Extensive commuting tends to jeopardize the student's academic program, health, ministry, and family life.

In keeping with the goal of the school to develop professional competence in ministry, students should use their pastoral appointments as learning contexts for field education programs initiated by the school. Special seminars and reflection groups are arranged in consultation with students to advance their professional growth and performance. For particular field learning projects, a supervisor may be assigned to guide the pastor's learning activity in the parish. Periodic evaluation will be expected from both supervisors and pastors. The required field education units may be done in the pastor's parish, if all the conditions outlined for credit are met, and all reports are completed and filed at the appropriate time.

Field Education Seminars

The two field education units of credit required for the Master of Divinity degree may be earned by approved field placement and participation in the seminars listed below. FE I is prerequisite to FE II. Seminars must be concurrent with, or must immediately follow, involvement in the approved field setting.

FE I. Ministerial Development Seminar. Through the use of case material, critical reflection upon the nature and task of ministry as experienced in a field context with special emphasis upon vocational development and ministerial role. Must be completed by end of third semester of study. Two hours a week. *Faculty or staff leadership*

FE II. Ministerial Practice Seminar. Case studies to develop competence in church administration, preaching and worship, pastoral care and counseling, and religious nurture and teaching. Must be completed during the last two semesters of study. Two hours a week. *Faculty, staff, and professional ministerial leadership*

Registration for these seminars should be done through the Registrar's office at the normal registration time. Since no semester-hour credit values are assigned to

these seminars, there will be no tuition charge for them. A quarter of clinical pastoral education completed in an approved setting may be substituted for both approved field placement and Field Education Seminar I but students who choose CPE for their Field Education II requirement will be required to take the FE II seminar.

Black Church Studies



The Black Church Studies Program

Black church studies at Duke Divinity School is an engagement of the Divinity School with the black church, black theology, and the black community, and represents an appreciation for study of and involvement in black religious experiences. The Black Church Studies Program exists to illuminate the several dimensions of these experiences, to study the contributions which the black church has made and is making to both the black community and American culture, and to help actualize the potential for service to the Church through its special concerns for ministry and mission to black people in both church and community. The program is a concrete expression of the role of black church studies in theological education which undertakes faithfully to serve Christ and his Church.

The Black Church Studies Program is the visible evidence of a quest for ministry, justice, and community among Divinity School faculty and students. It is a quest of teachers and seminarians, clergy and laity from both races for clearly developed curricular programs, research projects, and continuing education. It is recruitment, counseling, supervision, curriculum development, research, teaching, academic advising, continuing education, and service to black churches and congregations. It is, in conception and nature, an instrument which serves both internal and external interests of the Divinity School; and its immediate clientele is simultaneously the academic and religious communities.

The list of current course offerings in black church studies may be found in this catalogue in the chapter "Courses of Instruction." Faculty include Dr. C. G. Newsome and Mr. William C. Turner, Jr. Dr. Newsome is Assistant Professor of American Christianity; Mr. Turner is Instructor in Theology and Black Church Studies. In addition, black faculty from the religion department and from other departments of the University complement our offerings, and associates in instruction are secured as need arises.

The Black Church Studies Program and the Office of Black Church Affairs work cooperatively. The Black Church Studies Program functions in the areas of academic studies, curriculum development and teaching, and research. The Office of Black Church Affairs provides counsel and advice to prospective black seminarians in undergraduate schools, and has responsibility for continuing education for black pastors, recruiting, advising students about field education, placement, financial aid, adjustment, and a broad range of other student requirements. We encourage and welcome inquiries concerning a program of studies at Duke Divinity School. Further information about the Black Church Studies Program or the Office of Black Church Affairs is available from the Director of Admissions, Duke Divinity School, Durham, North Carolina 27706.

Continuing Education



The Continuing Education Center

Through the Continuing Education Center the Divinity School offers extensive opportunities in education for ministry. The Charles P. Bowles Continuing Education Center in the new wing of the Divinity School includes seminar rooms and spacious study carrels for ministers involved in individual study or in-residence seminars. The Divinity School Library; the Henry Harrison Jordan Loan Library; the growing collection of tape recordings of sermons, lectures, and interviews; the Pickens Communications Center; and the *Duke Divinity School Review* are also available for continuing education for ministry. The Divinity School provides a year-round program of in-residence seminars and conferences, extension seminars and consultations, and special services to ministers and churches throughout the nation.

Admission and Scholarships

Conferences, churches, and other supporting groups and institutions have made available through the Divinity School certain designated funds to assist in continuing education for ministry. Inquiries, applications for admission, and requests for continuing education scholarships for in-residence seminars should be directed to: Director of Continuing Education, Duke Divinity School, Duke Station, Durham, North Carolina 27706.

In-Residence Seminars and Conferences

During the academic year 1982-83 the Divinity School conducted or cosponsored a series of in-residence continuing education seminars, workshops, and conferences, with faculty and guest leaders. These included "Seminar on Wesleyan Theology;" "Nature and Meaning of Christian Ministry;" "Second International Colloquy on the History of Biblical Exegesis in the Sixteenth Century;" "North Carolina Economics Conference for Clergy;" "Interfaith Forum on Religion, Art, and Architecture;" "Rites of Initiation: Baptism and Confirmation;" "Living into Our Baptism: A Retreat;" "Faith, Science, and the Future;" "Christian Writers' Workshop;" and "Religious Themes in Literature." In addition, special seminars have been done for many districts, ministers preparing for ordination examinations, and special interest groups. Numerous individual ministers have been guided in special short-term and semester-long continuing education studies in the Divinity School.

A major week-long conference entitled "The Arts in the Church" was held in May. The conference was designed for ministers, church program directors, Directors

of Christian Education, and church musicians. The focus was the practical use of drama, dance, music, and art in the programming needs of the local church. This conference involved faculty from throughout the University.

Extension Seminars, Workshops, and Lectureships

Extension services in continuing education for ministry during 1982-83 included a varied series of seminars, workshops, lectureships, and conferences held in cooperation with district and conference continuing education committees, church agencies, and institutions of higher education and professional training for ministry. The Director of Continuing Education and other Divinity School and associated resource leaders provided such services as lectureships and preaching in pastors' schools and conferences, theological schools, and Christian educators' conferences in many states. Other services included faculty leadership in district colleague group studies and in Institute for Homiletical Studies groups, and cosponsorship of seminars at the Intentional Growth Center, Lake Junaluska.

Two faculty-led "Introduction to Mexico" travel-study seminars included ministers, laity, and divinity students. The Divinity School also offers a study seminar to China entitled: "The Challenge of Changing China."

The Convocation and Pastors' School

The annual Divinity School Convocation and North Carolina Pastors' School, a cooperative endeavor with the North Carolina and Western North Carolina Conferences of the United Methodist Church through the Board of Managers of the Pastors' School, brings together ministers, lay persons, students, and faculty for a series of lectures, sermons, and courses, along with alumni reunions and social occasions.

The Gray Lecturer in 1982 was Hugh Anderson of the University of Edinburgh. Browne Barr was the Hickman Lecturer. Other workshop and worship leaders included Bishop L. Scott Allen, John Cook, Robert E. Cushman, Jane Dillenberger, John Dillenberger, Sam Hill, Thor Hall, Peter Hall, Peter Lee, Roland Murphy, and Robert Rambush. Alumni gathered for class reunions and the general Alumni Association Luncheon, at which M. Wilson Nesbitt, Class of 1941, received the Distinguished Alumnus Award.

Lectures and Symposia

The James A. Gray Lectures. These annual lectures, established in 1950 as part of a bequest made in 1947 by James A. Gray of Winston-Salem, North Carolina, are delivered in the context of the Divinity School Convocation and North Carolina Pastors' School. The 1982 Gray Lecturer was Hugh Anderson of the University of Edinburgh. The 1983 Gray Lecturer will be Albert C. Outler of Perkins School of Theology, Southern Methodist University.

The Franklin S. Hickman Lecture. This lectureship was established in 1966 as part of a bequest by Mrs. Franklin S. Hickman in memory of her late husband, Dr. Franklin Simpson Hickman, Professor of Psychology of Religion, Duke Divinity School, and Dean of the Chapel, Duke University. This lectureship enables the Divinity School to bring practicing ministers of extraordinary qualities to lecture and preach in the Convocation and Pastors' School and to participate in Divinity School classes, worship, and informal sessions with students and faculty. The 1982 Hickman Lecturer was Browne Barr of San Francisco Theological Seminary. The 1983 Hickman Lecturer will be Martin E. Marty of the Divinity School, the University of Chicago.

Symposium on Christian Missions. Each year the Divinity School presents a symposium on the world mission of the Church, usually including a visit by a secre-

tary or missionary personnel. The general aims are "to inform students and faculty of the philosophy and work of missions as seen through the personal experience of speakers; to educate present and future ministers so that they will have a vital concern for the promotion of missionary education in the local church; and to evaluate the missionary enterprise as a significant force in the revolutionary world."

Ministry in the Vicinity

Ministers and churches in the vicinity of Duke University are especially welcome to avail themselves of continuing education programs, facilities, and other services of the Divinity School and its faculty and students. They are invited to attend public lectures, visit with distinguished lecturers, participate in in-residence seminars and conferences, audit selected courses, study in the continuing education carrels, and use the resources of the Divinity School Library, the Henry Harrison Jordan Loan Library, and the tape recordings collection. Divinity School faculty, staff, and students are generally available for preaching, teaching, and other services in churches of the community and region.

The Course of Study School

In cooperation with the Division of Ordained Ministry of the Board of Higher Education and Ministry and the Southeastern Jurisdictional Conference of the United Methodist Church, the Divinity School hosts the Course of Study School for pastors of the United Methodist Church. This school is in session for approximately four weeks each summer and the required studies for one full year can be completed in this period. This is not a part of the regular work of the Divinity School degree program, and no credit toward a seminary degree can be earned. The faculty includes representatives from the Divinity School and other church-related institutions. The thirty-fifth session of the Course of Study School was held 27 June-22 July 1983.

The J. M. Ormond Center for Research, Planning, and Development

This center was established in memory of the late Dr. J. M. Ormond, Professor of Practical Theology of the Duke Divinity School and Director of the Rural Church Program under the Duke Endowment, 1923-48. The North Carolina Annual Conference established the J. M. Ormond Fund in 1951 as part of the special effort of the North Carolina and the Western North Carolina Conferences of the United Methodist Church to provide additional programs at the Divinity School. The center is directed by Dr. Robert L. Wilson, Research Professor of Church and Society. It is jointly supported by the Ormond Fund and the program of the rural church under the Duke Endowment.

The center has three purposes. First, it assists the Church in its ministry by providing research and planning services. Second, it provides training for ministerial students in church and community studies. Third, it contributes through basic research to the understanding of the nature and functioning of the Church. Emphasis is given to research and planning studies of rural United Methodist Churches in North Carolina.

The Henry Harrison Jordan Loan Library

Henry Harrison Jordan, (1862-1931), distinguished member of the Western North Carolina Conference, was memorialized by his children by the establishment of an endowment in 1947. The Divinity School Librarian is the custodian of books purchased under this fund for loan, through postal services, to qualified ministers of all



denominations or localities. The Jordan Loan Library undertakes to maintain a catalogue of up-to-date publications representative of the several theological disciplines and areas of the minister's professional interest. Books may be borrowed by application to the Librarian of the Divinity School.

The Duke Divinity School Review

The Divinity School publishes a magazine designed to acquaint its readers with current theological thinking through the inclusion of public addresses given at the school, articles by faculty members and others, and book reviews. The *Review* is circulated free of charge to a mailing list of some 2,600, including alumni of the school, interested friends, campus ministers, teachers, administrators, and librarians. It is also available to students upon request.

Other Programs

Duke Summer Session. While the Divinity School does not presently offer a regular summer program, students may enroll for intensive biblical language courses (Greek in 1983, Hebrew in 1984) or individual directed study. Summer courses of graduate level may also be taken in other departments as cognate credits (maximum of two, see provisions under administration of the curriculum in the chapter "Curriculum."). Permission for such credits must be secured in advance from the instructor and from the Divinity School Registry, but official registration and payment of fees are handled in the Office of Summer Educational Programs, 120 Allen Building, Duke University, Durham, North Carolina 27706.

Facilities for Advanced Study through the American Schools of Oriental Research. Duke University is one of the supporting members of the American Schools of Oriental Research. Accordingly, students in the Divinity School have the privilege of attending the Albright Institute of Oriental Research in Jerusalem, the American Center of Oriental Research in Amman, and similar institutions without charge for tuition. They may also compete for the four fellowships offered annually by the schools, the stipends depending upon available funds.

Programs in Pastoral Psychology. Programs in pastoral psychology beyond the studies incorporated in the M.Div. curriculum are provided in cooperation with the Duke University Medical Center. Three such special programs are available.

1. The Master of Theology degree with a major in pastoral psychology is ordinarily a calendar year program beginning the first full week in June. However, upon the recommendation of the staff, candidates with a quarter or more of clinical pastoral education may begin their program in September. The candidate may plan one of three programs or concentrations: a concentration in pastoral theology relating psychology and theological understanding to professional ministry, especially the parish, through course work and supervised field or clinical experience; a concentration in pastoral care through course work and an intern year in basic clinical pastoral education; and a concentration in pastoral counseling through course work and a year of advanced clinical pastoral education. In the context of clinical pastoral education various professional goals may be sought including general understanding and skills in pastoral care and specialization in pastoral counseling and clinical supervision. The program in clinical pastoral education is certified by the Association for Clinical Pastoral Education. Persons specializing in pastoral counseling will advance toward certification with the American Association of Pastoral Counselors. A quarter of clinical pastoral education (PP 277A or its equivalent) is considered a prerequisite for all programs. Degree candidates who extend

their program over the calendar year receive three certified units of clinical pastoral education and nondegree candidates receive four certified units.

2. Single quarters of Basic Clinical Pastoral Education are offered each summer (beginning the first Monday in June and running for eleven weeks) and during the academic year extended over two semesters. When the quarter is completed within one semester, the student may take two other courses in the regular M.Div. program; when it is extended over two semesters, the student may take three other courses. Two transfer course credits will be granted for a summer CPE quarter or two course credits will be granted for the quarter taken during the academic year (unless a course credit has already been granted for PP 177, in which case only one additional credit will be given for the CPE quarter).

Students in CPE may not have other field education appointment or employment. However a CPE quarter will, when satisfactorily completed, count as one field education unit if taken in relation to either Field Education Seminar I or II. Only one field education requirement may be fulfilled by CPE.

Students are reminded that ordinarily no more than five courses out of twenty-four for the M.Div. degree should be taken in any one subdivision.

3. A one-year certificate or nondegree internship program in clinical pastoral education is available through the Duke Medical Center for persons who hold the Master of Divinity degree or its equivalent. Also, students who wish to pursue a pregraduation intern year are invited to apply, provided they have completed at least one year of theological education. The certificate, nondegree intern year can be done at any level of clinical pastoral education (basic, advanced, supervisory) at which the candidate and the supervisory staff judge appropriate. These persons may enroll in the Divinity School as special students for a course or two each semester. Such training usually provides four quarters of certified clinical pastoral education credit.

Admission to either the basic unit or the internship program of Clinical Pastoral Education is distinct from admission to the Divinity School. Applications for CPE enrollment are available in the Chaplain's Service Office, Duke Medical Center. The deadline for filing CPE applications is normally 15 January for the summer quarter and the intern year and 1 March for the extended quarter and the resident year.

For further information concerning any of these programs, write to Dr. Richard A. Goodling, Director, Programs in Pastoral Psychology, Duke Divinity School. See the section on the Master of Theology degree program.

Library Funds

The following funds provide resources to enrich the collections of the Divinity School Library.

Ormond Memorial Fund. Established in 1924 by Dr. J. M. Ormond, '02, and Mrs. Ormond, in memory of his mother and father, Mr. and Mrs. J. J. Ormond, the income from the Ormond Memorial Fund is to be used for the purpose of a collection of books on the rural church for the Divinity School Library at Duke University.

Avera Bible Fund. Established in 1895 by gift of Mrs. L. B. McCullers in memory of her husband, Willis H. Avera; the income to be used for the purchase of books for the Divinity School Library and for the support of the Avera Bible Lectures.

Louis W. Bailey Memorial Fund. This memorial fund was established in 1958 by the Reverend A. Purnell Bailey in memory of his father. The income is to be used for books for the Divinity School Library.

Stuart C. Henry Collection Endowment Fund. This fund was established by the Class of 1975 in honor of Professor Henry with income to be used to purchase books in the collection on American Christianity.

The William Arthur Kale, Jr. Memorial Fund. William Arthur Kale, Jr. was a member of the Duke University Class of 1958, a lover of sacred art and music, and a member of the University Chapel Choir. In 1964 his parents, Professor and Mrs. William Arthur Kale, Sr., established a fund in his memory for the purchase of books and other materials in the area of fine arts and religious musicology for the perpetual enrichment of the holdings of the Divinity School Library.

The Walter McGowan and Minnie Daniel Upchurch Fund. Established in 1971 by W. M. Upchurch, Jr., an alumnus of Duke University and a member of its Board of Trustees, the fund, honoring Mr. Upchurch's mother and father, is used for the purchase of materials in the area of sacred music and is supplementary to a collection of materials given by Mr. Upchurch to the Divinity School Library. This collection includes 1,487 anthems and other compositions of sacred music, along with sixty-two disc recordings of the Duke University Summer Chapel Choir for the years 1937-41, at which time Mr. Upchurch was Director of the choir.

Curriculum



Degree Programs

The academic work of the Divinity School embraces three degree programs: the Master of Divinity degree (M.Div.) ordinarily of three academic years; a one-year program beyond the basic degree, the Master of Theology (Th.M.); and a third program of two academic years leading to the degree of Master of Religious Education (M.R.E.). All are graduate-professional degrees. Admission to candidacy for any of these three degrees presupposes the completion of the A.B. or its equivalent.

Students preparing for ordination to the Christian ministry and requiring appropriate graduate-professional education will enroll for the Master of Divinity degree. Students whose acquired academic standing, under this basic degree program, entitles them to further specialized study may advance their command of selected theological disciplines by applying for an additional year of studies leading to the Master of Theology degree. Together, these two degree programs constitute a sequence. Although the Master of Divinity degree fulfills requirements for ordination by prevailing ecclesiastical standards, the Th.M. program may assist in assuring a larger measure of professional preparation. Application for admission to the Th.M. program is open to graduates of other schools who have completed the basic theological degree.

The Master of Religious Education degree program is designed to prepare qualified persons, ordinarily not seeking ordination, for a ministry of Christian education in local churches or other organizations. The course of study is arranged to provide grounding in biblical, historical, and theological disciplines as essential background for instruction in and exercise of professional competence in curricular planning, teaching methods, and supervision of educational programs for various age groups.

The specific requirements for each of these degrees are found in the succeeding pages. It is evident that completed course work cannot be credited toward more than one degree. Reciprocal transfer of credit for course work taken under either the M.Div. or the M.R.E. program requires the permission of the Associate Dean for Curricular Affairs.

Doctoral Studies Accredited by the Graduate School

The Divinity School provides a substantial body of course offerings to an advanced level in biblical, historical, and systematic and contemporary theological disciplines that are accredited alike by the Graduate School and the faculty of the Divinity School, and lead to the Doctor of Philosophy degree. Sharing responsibility with the University Department of Religion for staffing and curricular provision of this course of study, the Divinity School is the principal contributor to the program of graduate

studies in religion. However, since the Ph.D. in religion is certified and awarded under the Graduate School, the doctoral student's admission and matriculation are administered under that division of Duke University.

With few exceptions, most courses in the *Bulletin of Duke University: The Divinity School* carrying a 200 number or above and belonging to the fields noted above are applicable to doctoral programs of study. These courses are open to qualified M.Div., Th.M., or M.R.E. students by permission of the instructor.

Qualified persons who desire to pursue studies leading to the degree of M.A. or Ph.D. in religion, under the administration of the Graduate School, are advised to apply to the Dean of that school. Inquiries concerning fellowships or specific requirements of the Program of Graduate Studies in Religion may be addressed to the Director, 209 Divinity School.

Administration of the Curriculum

Students are required at the time of each registration period to plan their course of study with the consultation and approval of their assigned faculty advisers. Such programs are subject to the review and approval of the Committee on Academic Standing, the Dean, and the Associate Dean for Curricular Affairs. It is the responsibility of each student to see that all requirements for graduation (and for ecclesiastical ordination) are met, and that any special permission granted to deviate from the normal program is properly recorded on the personal files in the registry.

Grading System. The Divinity School employs the grading scale with the following letters, *A, B, C, D*, and *F* which have been defined as follows: *A*, excellent; *B*, good; *C*, satisfactory; *D*, passing; *F*, failure; *WI*, withdrew illness; *W*, withdrew, discretion of the Dean; *I*, incomplete; *P*, passed; *NC*, noncredit; *Z*, year course. At the discretion of the instructor, individuals or classes may in certain instances be graded simply as pass or fail. Such *P/F* grades shall be limited to no more than 25 percent of a student's total curriculum at Duke and will not be figured in the grade point average.

The denotations are defined as follows according to quality points: *A*, 4; *A-*, 3.7; *B+*, 3.3; *B*, 3.0; *B-*, 2.7; *C+*, 2.3; *C*, 2.0; *C-*, 1.7.

Limited Program. Students whose work after admission is not satisfactory may be placed on limited programs by the Academic Standing Committee and required to reduce their course loads or to make other academic adjustments. Students who during the first year of Divinity School maintain less than a *C* (2.0) average, including failures, ordinarily will be required to withdraw from the school.

Incompletes. A student may petition the Associate Dean for Curricular Affairs to receive a grade of incomplete in a course. This petition must be filed in writing on the prescribed form with the registry on or before the last official day of classes of the semester in question. Such permission may be granted when a student, through some circumstances beyond control, such as illness, has been hindered from meeting the course requirements. Adjudication of the petition will rest with the Associate Dean and the instructor concerned. The Associate Dean will communicate in writing to the student regarding the joint decision and any conditions attached thereto. An incomplete becomes an *F* unless it is removed through completion of assigned work by the following dates: for incompletes incurred in fall semester courses, 1 February; for incompletes incurred in spring semester courses, 15 September.

Change of Courses or Withdrawal. Students are permitted to change their course registrations, without incurring a penalty, during the prescribed drop/add period at the beginning of each semester. Any alteration in the number of courses must be officially reported and recorded. The adding of a course requires the permission of the instructor of that course as well as the student's faculty adviser. Any refund of

tuition related to withdrawals will be according to the published schedule.

No student will be permitted to withdraw from a course after one-half of the semester without incurring failure, except for causes adjudged by the Associate Dean for Curricular Affairs to be beyond the student's control. Conditions of genuine emergency and not considerations of convenience will be determinative in considering requests, which must be submitted in writing on academic petition forms.

Leave of Absence. A student wishing to take a leave of absence for one or two semesters, and intending to return to a degree program in the Divinity School, should so notify the Associate Dean for Curricular Affairs in writing in advance. No leave of absence will be granted for more than one full academic year, although an emergency extension may be requested from the Associate Dean.

Withdrawals from School. Students deciding to withdraw from the Divinity School, for whatever reason, should consult with their faculty advisers and the Associate Dean for Curricular Affairs, and must file a written statement of withdrawal prior to departure. All students who have officially withdrawn or whose leave of absence extends beyond one academic year but who wish later to return to the Divinity School will be required to reapply for admission, and provide whatever documentation is required by the Director of Admissions.

Directed Study. Students may, with permission of their faculty advisers and the instructors involved, take one or two units of Directed Study, preferably not in the same semester. These independent study courses under individual faculty supervision are ordinarily in subjects at an advanced level which cover material not available in the regular curriculum. Students wishing to take more than two courses by Directed Study must have permission from the Associate Dean for Curricular Affairs in consultation with the student's faculty adviser and the instructor who agrees to direct that study.

Cognate Courses. Students may, in consultation with their faculty advisers, take up to two graduate level courses in other departments of Duke University or at the University of North Carolina. Permission for more than two such cognate courses must be secured from the Associate Dean for Curricular Affairs, but courses in the Duke Department of Religion do not count within this limit.

Graduation with Distinction. Students who achieve a grade point average of 3.85 for overall academic records in the M.Div. and M.R.E. programs are granted the degree *summa cum laude*. Students with a grade point average of 3.65 or above are awarded their degrees, *magna cum laude*. Such distinction is calculated on the basis of letter grades only, totaling at least three-quarters of all courses taken at Duke, and will be indicated on the student's diploma.

Part-Time Students. Students taking less than three courses in any given semester are considered part-time students and are ineligible for financial aid from the school or student health services.

Auditors. Full-time students paying for at least three courses are permitted to audit additional courses, if space permits, with the approval of their advisers, the Associate Dean for Curricular Affairs, and the instructor of the class. Special students, part-time students, or persons not candidates for degrees in the University are charged an audit fee for each such course.

The Basic Theological Degree—Master of Divinity

The faculty of the Divinity School constantly endeavors to review the curriculum as a whole and to tailor individual courses to meet the needs of a rapidly changing world. Major curricular revisions were instituted in 1948, 1959, and 1967. The curric-

ulum is, therefore, not static but dynamic and is always subject to emendation by the faculty.

This degree program is structured to elicit a positive response to: (1) the challenge to provide an adequate professional education—education for ministry; (2) the needed variability of ministries in today's complex world; (3) the norms of university education; and (4) the Christian tradition.

Aims of the Curriculum. The aims of the basic degree program focus upon four goals, four areas of personal and curricular responsibility, four lifelong tasks which should be strongly advanced during the seminary years.

1. *The Christian Tradition.* To acquire a basic understanding of the biblical, historical, and theological heritage.
2. *Self-Understanding.* To progress in personal and professional maturity—personal identity, life-style as an instrument of ministry, major drives, handling of conflict, resources, and professional competency and so forth. This is to be coupled with a sensitivity to the world in which we minister—its social forces, its power structures, its potential for humanization and dehumanization.
3. *Thinking Theologically.* To have the ability to reflect about major theological and social issues and to define current issues in theological terms and theological issues in contemporary secular terms.
4. *Ministering-in-Context.* To have the ability to conceptualize and participate effectively in some form of contemporary ministry.

Goals of such scope cannot be neatly programmed in any curriculum, and the degree of achievement (in seminary and beyond) will vary with individuals and their own motives and incentives.

The Basic Curriculum—General Description. Graduation requirements for the Master of Divinity degree consist of satisfactory completion of twenty-four courses, including the eight basic courses or their equivalent, with an overall grade point average of C (2.0) or better, plus satisfactory completion of two units of approved field education with appropriate seminars.

The basic curriculum provides for foundational courses in biblical, historical, theological, and ministerial studies, representative of the tradition and regarded as indispensable background for subsequent elective work and individual program information. These required courses total eight of the twenty-four courses necessary for graduation. They are Old Testament 11, New Testament 18, Church History 13 and 14, American Christianity 28, Christian Theology 32, Christian Ethics 33, and Black Church Studies 124. The opportunity of advanced standing adds further variability to the academic program, depending upon the nature and quality of the student's undergraduate academic work. Sixteen courses, two-thirds of the required total, are available for working out an individualized program of studies leading to specialized preparation in academic depth and for purposes of professional ministerial competence.

Required courses may be staffed by one or more professors and are planned to treat subject matter both in scope and depth at the graduate level.

The formulation of the student's course of studies is guided by certain broad but normative recommendations for area distribution of courses and by the advice and counsel of appointed faculty advisers or authorized directors.

Students and advisers are directed to read diligently the paragraphs on elective studies and professional aims and distribution of elective studies in the section on administration of the curriculum.

All academic programs are subject to review and emendation by the Dean and the Associate Dean for Curricular Affairs for the fulfillment of the aims of the curric-

ulum. The declared vocational and professional objective of the student is of central importance both to the student and to the faculty adviser in planning the student's comprehensive study program.

Six semesters of residential study are ordinarily required for the completion of the degree. With permission of the Associate Dean for Curricular Affairs, certified nonresidential study, not exceeding the equivalent of eight courses, may be permitted to a candidate for the basic degree.

The normal academic load is four courses per semester. A student with demonstrated competence may, with the consent of the academic adviser and the Associate Dean for Curricular Affairs, enroll for an additional course in the middler and senior years.

General Features of the Basic Curriculum. The following is a brief summary of the basic curriculum.

1. Twenty-four courses and six or more semesters of residency are required for graduation.
2. Each student is required to complete two approved assignments in field education (with or without remuneration) under supervision. Such assignments might include an internship, a summer of full-time work, two semesters of part-time work, or involvement in church or community service. The essential criteria for graduation credits are that the amount and quality of supervision be approved by the Office of Field Education, and that the student be required to evaluate and correlate the experience directly.
3. A normal academic load is four courses with credit.

Admission to candidacy for the Master of Divinity degree is admission to the regular program of studies. The suggested paradigm defines the normal sequence of the student's developing program. Students enrolled for less than three courses are considered part-time and are not eligible for financial aid or student health services.

The curriculum intends to serve graduate-professional aims with maximum flexibility. Sixteen elective courses are available and may be programmed to satisfy vocational and professional preferences. In planning a course of study, the student, in consultation with the adviser, should choose a program which will give a broad understanding and appreciation of future professional responsibilities. Members of the faculty and staff welcome inquiries.

Professional ministries include those of the parish, preaching, teaching, and pastoral care; ministries of education in local churches and higher education; missions; campus ministry; specialized urban and rural ministries; chaplaincies—hospital, institutional, industrial, and military; teaching; religious journalism; audiovisual communications; church agencies; and ecumenical ministries at home and abroad. For many of these, further specialized training will necessarily be sought elsewhere beyond the basic degree. For all of these ministries the student's program of studies can be shaped for the particular ministry in view.

Students are encouraged to elect at least one course in each of the following areas or subdivisions of the curriculum beyond the required courses: American Christianity; history of religion; Christian education; world Christianity and ecumenics; biblical exegesis; pastoral psychology; Christian ethics; worship and preaching; care of the parish (including church and community). Such advanced courses should be selected with a view to the individual's vocational and professional aims and in consultation with the student's faculty adviser. Students are also encouraged to concentrate, usually in not more than five courses in any one subdivision of the curriculum, in an area directly related to their vocational and professional intention. The program of each student is subject to review and revision by action of the faculty adviser, the Committee on Academic Standing, the Associate Dean for Curricular Affairs, or the Dean.

A SUGGESTED CURRICULAR PARADIGM

Junior Year

Fall Semester

Old Testament 11
Church History 13
Elective
Elective

Spring Semester

New Testament 18
Church History 14
Elective
Elective

Middler Year

Fall Semester

Systematic Theology 32
American Christianity 28
Elective
Elective

Spring Semester

Christian Ethics 33
Black Church Studies 124
Elective
Elective

Senior Year

Fall Semester

Four elective courses

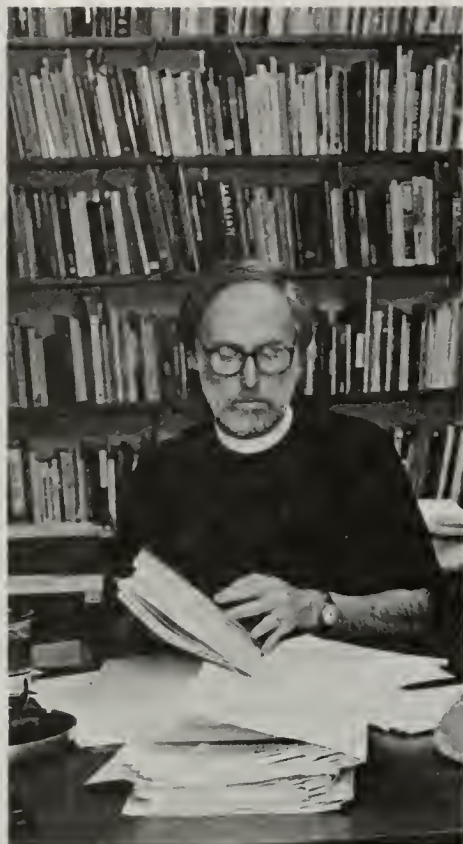
Spring Semester

Four elective courses

Student Pastors. Students in candidacy for the Master of Divinity degree who serve as full-time pastors or work more than fifteen hours per week in addition to their academic schedule are advised that their degree programs will usually require a fourth academic year. Modification of this schedule requires the approval of the Associate Dean for Curricular Affairs on recommendation of the Assistant Dean for Field Education.

1. Students with pastoral charges or comparable extracurricular responsibilities ordinarily will enroll for not more than three courses.
2. Students who accept pastoral charges in their middler or senior year are required to have the prior approval of the Assistant Dean for Field Education. Such students will be required to restrict their course work in accordance with regulation 1 above.
3. Modifications of these regulations will be scrupulously administered. Academic achievement, normally a *B* average, must be demonstrated before any modification of these requirements is allowed. Since adequate indication of the student's academic proficiency is not available before the completion of the first academic year, no modification of regulation 1 is possible for junior students.
4. Students who secure minor employment outside the channels of the Office of Field Education are required to inform the Assistant Dean for Field Education. Students carrying an outside employment work load of more than fifteen hours per week will be required to limit their academic load.
5. Ordinarily a student may not commute more than fifty miles (one way). Students living farther away than this will be required to stay in Durham during the academic week.
6. Student assistant pastors (not pastors-in-charge) may enroll for a full academic load if they are not on limited program, if their work is under the supervision of the Assistant Dean for Field Education, and if their field duties involve no more than fifteen hours per week.

Study Abroad. Study abroad, with transferable credit toward graduation, may be allowed for a candidate for the Master of Divinity degree by approval of the Associate Dean for Curricular Affairs. A strong academic record is a prerequisite. Ordinarily, permission for such study may be granted to students who have completed the



work of the middler year. Both the institution abroad and a specific course of study proposed must have the prior approval of the Associate Dean for Curricular Affairs. Required courses and the two field education units must usually be completed at Duke.

Transfer Credits. Transfer of credit to the Divinity School of Duke University, leading to candidacy for the degree of Master of Divinity, will normally be limited to one-third of the academic credits (in proportional evaluation) required for fulfillment of degree candidacy (see the chapter, "Admissions").

Advanced Placement. Students may, on the basis of undergraduate courses, a religion major, or other substantial preparation, be given advanced placement in one or more of the eight required subjects. Such placement normally presumes at least two college courses in a given area (e.g., Old Testament) with a satisfactory grade average.

Students who do not receive advanced placement at matriculation but who believe that they can qualify for upper level work without the introductory course may apply to the Associate Dean for Curricular Affairs. The faculty in the appropriate division (biblical, historical, or theological) will set procedures for determining basic competence in the particular field, ordinarily by an examination and assigned paper. A student may apply for such testing only once in a single area, not later than the beginning of the fourth semester.

Ordination Requirements. Students preparing for ordination are strongly advised to ascertain early in their seminary program the precise ordination requirements of their denomination.

United Methodist students must fulfill educational requirements in the *Discipline*, by completing the year-long course on Methodist doctrine, history, and polity (CP 159 and 160). Most annual conferences also require one or more courses in preaching and worship and/or clinical pastoral education.

Students from other denominations should consult with their appropriate church bodies for specific requirements, which may include biblical languages. Polity courses for certain other denominations may be offered from time to time by faculty members or local clergy on prior request.

Time Limit. Ordinarily it is expected that the work for the Master of Divinity degree be completed in three academic years (four for students who are on limited program, who serve as pastors, or who serve internship years). Extension of the student's work beyond six years from initial matriculation requires the approval of the faculty.

The Master of Religious Education Degree

The course of study leading to this degree is designed for persons desiring to prepare for leadership and service in the educational ministry of the church.

Admission. Applications for admission to the Master of Religious Education program are evaluated by the same standards as those applicable to the Master of Divinity degree, and admission requirements and procedures are also the same. Students planning to specialize in Christian education should study the sections of this bulletin which contain statements of policy regarding the most appropriate prerequisite studies for theological education and the procedures to be followed in applying for admission.

Requirements. The Master of Religious Education degree usually requires two years, or four semesters, of residence and study and the fulfillment of the following requirements:

1. Sixteen courses, twelve of them limited electives and four free electives, selected by the candidate in consultation with the academic adviser.
2. One unit of supervised field education.
3. An overall grade point average of C (2.0) or better in those courses receiving letter grades.
4. A final comprehensive examination.

Program of Study for M.R.E. Degree

Limited electives	12
Four courses in Christian Education	
Two courses in the Biblical Division	
Two courses in the Historical Division	
Two courses in the Theological Division	
Two courses in the Ministerial Division (other than Christian Education)	
Free electives (which may include one cognate course in another department of the University)	<u>4</u>
	16
Final Comprehensive Examination	

The Master of Theology Degree

The course of study leading to the degree of Master of Theology is designed for graduates of accredited theological schools who desire to continue or resume their theological education for enhancement of professional competence in selected areas of study. Enrollment in the Th.M. degree program is open to a limited number of students who have received the M.Div. (or the equivalent) with superior academic records.

Inquiries on admission may be addressed to the Director of Admission for referral to the Director of the Th.M. Program.

General Requirements. The general requirements for the degree of Master of Theology are:

1. Eight course units of advanced studies, with an average grade of B (3.0 average on a 4.0 scale).
2. Superior performance in a comprehensive examination covering the major area of study. As an alternative to the comprehensive examination the student may elect to do a research project in one major area if approved by the supervising professor. This project shall carry one course credit, to be counted within the eight units required.
3. Residence for one academic year.

There are no general language requirements. However, classical or modern languages may be required for certain programs (for example, in biblical studies, Hebrew or Greek may be required).

The Program of Study. At least four of the required eight courses must be taken in one of the basic divisions of study (biblical, historical, theological, or ministerial) which shall be designated as the candidate's major, and at least two courses in another of the divisions which shall be designated as the candidate's minor. Ordinarily, no more than two units may be taken through directed reading, and no more than one of these in any one semester. In the area of pastoral psychology, up to four course units may be taken through clinical pastoral education.

The comprehensive examination will be given at the close of the course of study for the degree, ordinarily in May or September.

The entire program of studies and comprehensive examination should be completed within twelve months. In some cases, the time limit may be extended, but in

no case beyond three years.

The candidate majoring in pastoral psychology may plan one of three programs or concentrations: a concentration in pastoral theology relating psychology and theological understanding to professional ministry, especially the parish, through course work and supervised clinical experience; a concentration in pastoral care through course work and an intern year in basic clinical pastoral education; a concentration in pastoral counseling through course work and a year of advanced clinical pastoral education. In the context of clinical pastoral education various professional goals may be sought, including general understanding and skills in pastoral care and specialization in pastoral counseling and clinical supervision. The Clinical Pastoral Education Program is certified by the Association for Clinical Pastoral Education. Persons specializing in pastoral counseling will be moved toward certification with the American Association of Pastoral Counselors. Course PP 277A (or its equivalent) is considered a prerequisite for a major in pastoral psychology, but is not applicable toward the eight courses required for the degree, although it will be indicated on the student's transcript. Accordingly, the student majoring in this area should ordinarily make provision for a program extending for a full calendar year beginning the first week in June.

Financial Aid. Please note in the pertinent sections of the chapter "Financial Information" that the charges for tuition and general fee for the Th.M. degree are combined and are made on the basis of the number of courses taken, and that in order to be eligible for medical care a student must be taking at least three courses.

Special Programs

Duke Divinity School is a participant in the National Capital Semester for Seminary students conducted by Wesley Theological Seminary in Washington, D.C. Students may, with the approval of the Associate Dean for Curricular Affairs, enroll in this one-semester program focused on political issues and social ethics, and receive up to four transfer credits. Applicants must have completed at least two and not more than four semesters at Duke to be eligible.

International Study Programs

For several years the Divinity School has been developing programs of international study and exchange involving faculty and students. The main areas in which the development is centered at this time are the following:

Mexico Seminar. Brief intensive travel-study to foster appreciation of Mexico, its people, history, culture, and religion—with special attention to the faith and mission of the church in Latin America today. Direct encounter with Third World poverty. About twelve persons per seminar. Twice annually.

China Seminar. A travel-study seminar on the re-emergence of the Church in China focusing on the unprecedented response to the Church in a Marxist society. Participants have the opportunity also to learn about China and its people and see firsthand the changes taking place in this remarkable country. Biannually.

Robert E. Cushman Exchange Fellowship. Each year faculty and staff nominate a student to represent the Divinity School in the Bonn/Duke Exchange program. At Bonn University (West Germany) the student for a year becomes thoroughly acquainted with another culture and different church life. Full participation in classes at Bonn required. Language preparation necessary.

Dumfries, Scotland. In cooperation with St. Michael's Parish, Dumfries, Scotland, the Divinity School offers an academic year's experience. A modest stipend

provides basic support and trans-Atlantic air fare. This opportunity is open each year to one rising senior who serves as a full-time parish assistant for this parish of the Church of Scotland.

Courses of Instruction



Course Enrollment

The required courses of the curriculum are: Old Testament 11, New Testament 18, Church History 13 and 14, American Christianity 28, Christian Theology 32, Christian Ethics 33, and Black Church Studies 124. Other courses numbered through 199 are elective courses for Divinity School students only. Most courses numbered 200 and above are approved for credit by both the Divinity School and the Graduate School, and require the permission of the instructor. For other prerequisites the student should consult the roster of courses of instruction in this bulletin and should also refer to published registration advices at the time of registration for each semester.

Courses jointly approved by the Divinity School and the Graduate School of Duke University are published in the *Bulletin of Duke University: The Divinity School*. Courses offered in the Department of Religion of Duke University, or as cognate courses in other departments, must be of graduate level (numbered 200 or above) in order to fulfill requirements for degrees in the Divinity School.

Projected Course Offerings

The following list of proposed course offerings for the 1983–84 academic year is tentative and subject to change. Detailed listings are available at the time of preregistration in the middle of the preceding semester, and more distant plans may be ascertained by consulting the divisional representative or the instructors concerned.

Fall Semester 1983

Old Testament (OT) 11, 115, 209, 351
New Testament (NT) 103, 105, 116A, 117C, 118, 226D, 226E, 341
Church History (CH) 13, 126
Historical Theology (HT) 246, 308, 337
American Christianity (AC) 28, 127, 384, 395
Christian Theology (CT) 32, 108, 110, 112, 220, 225, 229, 325, 352
Christian Ethics (CHE) 112, 220, 245, 262, 291, 387
Black Church Studies (BCS) 100
World Christianity (WC) 135
Care of the Parish (CP) 128, 142, 147, 152, 157, 159
Christian Education (CED) 101, 105, 192, 231
Church Worship (CW) 166, 178
Pastoral Psychology (PP) 70, 164, 170, 174, 176B, 176D, 177, 271, 277B, 278, 281A
Preaching (PR) 30, 162, 163

Spring Semester 1984

Old Testament (OT): 106D, 116, 223C, 223D, 353
New Testament (NT): 18, 104, 116D, 117A, 227A, 312, 341

Church History (CH): 14, 105, 202, 236
 Historical Theology (HT): 219, 261
 American Christianity (AC): 385, 396
 Christian Theology (CT): 108, 134, 200, 216, 220, 272, 300, 322
 Christian Ethics (CHE): 33, 136, 220B, 244, 294
 Black Church Studies (BCS): 100, 124
 World Christianity (WC): 386
 Care of the Parish (CP): 129, 130, 158, 160
 Christian Education (CED): 101, 175, 220
 Pastoral Psychology (PP): 170, 173, 175, 178, 273, 275, 277C, 281B
 Preaching (PR): 30, 161

I. Biblical Studies

OLD TESTAMENT

11. Introduction to Old Testament Interpretation. An introduction to the literature, history, and religion of ancient Israel with emphasis upon exegetical methodology. *Bailey and Murphy*

101. The Prophetic Movement. A study of the prophetic movement in Israel from the earliest period to the postexilic development of apocalyptic with special reference to the content and religious teaching of the prophetic writings. *Efird*

106. Exegesis of the English Old Testament. Prerequisite: OT 11 or equivalent.

106A. Genesis. *Bailey*

106B. Amos and Hosea. *Bailey*

106D. Wisdom Literature in the Old Testament. *Murphy*

106E. Old Testament Psalms. Exegesis of various literary types; theological orientation of Old Testament liturgical prayer; implications for prayer and liturgy today. *Murphy*

109. The Religion of the Old Testament. A study of the religious ideas contained in the Old Testament with special reference to their interpretation from Robertson Smith to the present. *Efird*

115–116. Introduction to Biblical Hebrew. Elements of phonology, morphology, and syntax. Exercises in reading and writing Hebrew. Exegetical treatment of the book of Jonah. (Two semesters: no credit will be given for 115 without completion of 116.) *Bailey*

130. Dying and Death. Critical consideration of biblical, legal, medical, and ethical perspectives. Prerequisites: OT 11, NT 18, or equivalents. *Bailey, H. Smith, and others*

180. From Text to Sermon. (See PR 180.) *Staff*

207. Intermediate Biblical Hebrew I. Historical Hebrew grammar with reading and exegesis of Old Testament prose (Pentateuch and historical books in alternate years). *Wintermute*

208. Intermediate Biblical Hebrew II. Historical Hebrew grammar and rapid reading of prose and poetry. *Meyers*

209. Old Testament Theology. Studies of the Old Testament in regard to theological themes and content. Prerequisite: OT 11 or equivalent. *Murphy*

220. Rabbinic Hebrew. An interpretive study of late Hebrew, with reading from the Mishnah. *Staff*

223. Exegesis of the Hebrew Old Testament. Prerequisite: OT 115–116.

223A. Amos and Hosea. Stress on hermeneutical method. *Bailey*

- 223B. Job. *Murphy*
- 223C. I Samuel. *Bailey*
- 223D. Song of Songs. *Murphy*
- 223E. Ecclesiastes. *Murphy*

237. History of the Ancient Near East. Emphasis upon the religions, literature, and art of Mesopotamia. *Bailey*

242. Life after Death in Semitic Thought. Consideration of the various ideas from the early second millennium through the Intertestamental Period. Exegesis of selected Old Testament passages. Evaluation of recent research. Prerequisite: OT 11 or equivalent, knowledge of Hebrew helpful but not required. *Bailey*

302. Studies in the Intertestamental Literature. Selected documents of the Apocrypha and Pseudepigrapha examined exegetically and theologically in their relation to postexilic Judaism. *Staff*

304. Aramaic. A study of the Aramaic portions of the Old Testament and selected passages from the Elephantine and Qumran texts. *Wintermute*

350, 351. Seminar in Old Testament. Research and discussion on selected problems in the Old Testament and related fields. *Murphy*

353. Seminar on Text Criticism. Emphasis upon transmission, versions, apparatus, and method. Prerequisites: NT 103–104 and OT 115–116 or equivalents. *Bailey and others*

373–374. Elementary Akkadian. Study of the elements of Akkadian grammar. Reading of neo-Assyrian texts shedding light on the Old Testament. Prerequisite: biblical Hebrew. (Two semesters: not credited separately.) *Bailey*

375–376. Elementary Ugaritic. Study of the elements of Ugaritic. Prerequisite: biblical Hebrew. (Two semesters: not credited separately.) *Staff*

NEW TESTAMENT

18. Introduction to New Testament Interpretation. An introduction to the literature of the New Testament with special attention to the perspectives and methods of historical-critical investigation and interpretation. *Efird or M. Smith*

103–104. Hellenistic Greek. Designed for beginners to enable them to read the Greek New Testament. (Two semesters: no credit will be given for 103 without completion of 104; however, students with at least one full year of college Greek may be permitted to enroll in 104.) *Efird*

105. Studies in Paul. An investigation of Paul's apostolate based upon the Acts and the Epistles with attention to Paul's theology as reflected in selected passages. *Efird*

114. Jesus in the Gospels. A consideration of the origins, transmissions, and literary fixation of the Jesus traditions with special attention to the message of the Kingdom, the problem of messianic self-consciousness, and the passion. *M. Smith*

116. Exegesis of the English New Testament I. *Staff*

- 116A. Luke-Acts
- 116B. Galatians
- 116C. Selected Later Epistles
- 116D. I and II Corinthians

117. Exegesis of the English New Testament II. *Staff*

- 117A. The Gospel and Epistles of John

117B. Romans
117C. Revelation
117D. Mark

118. The New Testament in Greek. Readings in the Gospels. *Staff*

119. The New Testament in Greek. Readings in the Epistles. *Staff*

180. From Text to Sermon. (See PR 180.) *Staff*

225. Living Issues in New Testament Theology. Critical examination of major problems and issues in New Testament interpretation and theology. Prerequisite: NT 18 or equivalent. *M. Smith*

226. Exegesis of the Greek New Testament I. Prerequisite: NT 103–104. *Price, M. Smith, or Young*

226A. Mark and Matthew

226B. Romans

226D. I and II Corinthians

226E. The Gospel and Epistles of John

227. Exegesis of the Greek New Testament II. Prerequisite: NT 103–104. *Price, M. Smith, or Young*

227A. Luke-Acts

227B. Galatians

227C. The Pastoral Epistles

311. Pharisaic Judaism in the First Century. A reading course in first-century Pharisaic Judaism. *Staff*

312. Pauline Theology. Studies in some aspects of Paulinism in the light of recent scholarship. *Staff*

314. Judaism and Christianity in the New Testament. A study of their interaction with special attention to Paul. *Staff*

319. The Gospel According to St. Matthew in Recent Research. *Staff*

340, 341. Seminar in the New Testament. Research and discussion on a selected problem in the biblical field. *Price and M. Smith*

345. The Epistle to the Hebrews in Recent Research. *Staff*

II. Historical Studies

CHURCH HISTORY

13. History of the Church to the Protestant Reformation. A survey through the fifteenth century in terms of spiritual genius, organizational development, great literature, and representative movements. *Gregg*

14. History of Modern European Christianity. A survey of the main currents in Reformation and post-Reformation church history. *Steinmetz*

105. Studies in Patristic Christianity. Selected issues in the worship, theology, and politics of the early Church. *Gregg*

126. The English Reformation. The religious history of England from the accession of Henry VIII to the death of Elizabeth I. Extensive readings in the English reformers from Tyndale to Hooker. *Steinmetz*

140. The Rise of Methodism and the Anglican Background. The Methodist societies within the Church of England to the death of Wesley. Prerequisite: CH 13–14. *Staff*

201. Schism and Heresy in Early Christianity. Studies of crises precipitated by movements such as Gnosticism, Donatism, Arianism, and Pelagianism. *Gregg*

202. Religion of the Cappadocian Fathers. Examination of the careers and writings of Basil, Gregory of Nyssa, and Gregory of Nazianzus. *Gregg*

206. Christian Mysticism in the Middle Ages. Source studies in historical perspective of such late medieval mystics as Bernard of Clairvaux, the Victorines, Ramon Lull, Meister Eckhart, Richard Rolle, Catherine of Siena, and Nicholas of Cusa. Prerequisite: CH 13. *Steinmetz*

236. Luther and the Reformation in Germany. The theology of Martin Luther in the context of competing visions of reform. *Steinmetz*

247–A, B. Readings in Latin Theological Literature. Critical translation and study of important theological texts in Latin from various periods of the history of the Church. Prerequisite: reading knowledge of Latin (introductory course offered in the classics department). *Staff*

334. Theology and Reform in the Later Middle Ages. Examination of selected issues in the life and thought of the medieval church from the twelfth century through the fifteenth century. Readings in popular and academic theologians from Pierre Abelard to Gabriel Biel. *Steinmetz*

335. The English Church in the Eighteenth Century. Studies of Christianity in England from the Act of Toleration, 1689, to the death of John Wesley, 1791. *Staff*

344. Zwingli and the Origins of Reformed Theology. Source studies in the early Reformed tradition. *Steinmetz*

HISTORICAL THEOLOGY

114. Christologies of the Early Church. Investigation of important soteriologies and debates centering upon the person of Christ from the second through the fifth centuries. *Gregg*

123. Readings in Historical Theology. Prerequisite: CH 13–14. *Staff*

201. Christian Thought in the Middle Ages. A survey of the history of Christian theology from St. Augustine to the young Martin Luther. *Steinmetz*

204. Origen. The systematic and apologetic writings of an important Alexandrian thinker and exegete of the third century. *Gregg*

219. Augustine. The religion of the Bishop of Hippo in the setting of late antiquity. *Gregg*

241. Problems in Reformation Theology. Prerequisite: permission of the instructor. *Steinmetz*

246. Problems in Historical Theology. Prerequisite: permission of the instructor. *Staff*

260. Life and Thought of the Wesleys. A seminar on John and Charles Wesley and their colleagues in relation to English culture and religion in the eighteenth century. Prerequisite: permission of the instructor. *Staff*

261. The Theology of John Wesley. A study of the development and structure of Wesley's theology with special reference to his doctrines of man and salvation. *Richey*

308. Greek Patristic Texts. Critical translation and study of selected Greek texts illustrative of significant aspects of patristic theology and history from the second through the fifth century A.D. *Young*

313. The Apostolic Fathers. A study of the religious thought in the writings of the Apostolic Fathers. *Young*

317. Seminar in the Greek Apologists. A study of the apologetic writings of the Greek Fathers in relation to the challenges of their contemporary world. Special attention will be given to leading protagonists of late Graeco-Roman culture, such as Celsus, Porphyry, and Julian. *Young*

318. Seminar in the Greek Fathers. A study of selected topics from the Greek Fathers. *Young or Gregg*

337. Theology of St. Thomas Aquinas. Intensive reading in the *Summa Theologica* and biblical commentaries. *Steinmetz*

338. Calvin and the Reformed Tradition. The theological development of John Calvin. A comprehensive examination of his mature position with constant reference to the theology of the other reformers. *Steinmetz*

AMERICAN CHRISTIANITY

28. History of American Christianity. A consideration of the nature of Christianity in America and the history of its development. *Henry and Newsome*

127. Modern American Religious Leaders. Recent American Christianity as seen through selected biographical studies. *Newsome*

199. The American Social Gospel. A study of Protestant social thought and action in America since 1865. *Newsome*

296. Religion on the American Frontier. A study of the spread of evangelical Christianity as a theological and cultural phenomenon of the American West. *Henry*

377. Contemporary American Theater and Evolving Theological Forms. An examination of creed and ritual implicit and explicit in contemporary American theater of stage, film, and television. *Henry*

384. Religious Dissent in American Culture. History and significance of dissent in the theology and culture of America. *Henry*

385. Religion in American Literature. A critical study of the meaning and value of religious motifs reflected in American literature. *Henry*

395. Christian Thought in Colonial America. Exposition of the main currents in Protestant theology. *Henry*

396. Liberal Traditions in American Theology. A study of the main types of modern religious thought, beginning with the theology of the Enlightenment. *Henry*

397. Contemporary American Theology. A critical appraisal of major tendencies. *Henry*

HISTORY OF RELIGIONS

180. Introduction to Asian Religions. Preliminary consideration of problems and methods in the study of religious traditions, followed by a survey of the historical development, beliefs, practices, and contemporary significance of the Islamic religion and the religions of India, China, and Japan. *Staff (Department of Religion)*

See other courses offered in the Department of Religion.

III. Theological Studies

CHRISTIAN THEOLOGY

32. Christian Theology. The major themes of the theology of the Church. *Herzog, Langford, and Robinson*

101. Types of Religious Philosophy. Basic historical orientation to religious thought, especially in Western culture. *Robinson*

102. Science and Biblical Theism. Implications of scientific knowledge in relation to biblical understandings of creation, revelation, and providence. *Robinson*

108. Major Types of Protestant Theology. A survey of Protestant theology from the reformers to Karl Barth. (For juniors only.) *Herzog or Langford*

110. This Life and the Age to Come. Christian eschatology and the meaning of history in the light of God's triumph over sin, suffering, and death. *Robinson*

111. A Christian Faith-Understanding of God. A systematic examination of biblical and philosophical concepts of God in relation to the life of Christian faith. *Robinson*

112. The Doctrine of the Holy Spirit. An examination of pneumatology under systematic categories which include: creation, Old Testament, prophecy, the life and ministry of Christ, the Church, salvation, the canon, the sacraments, and eschatology. *Turner*

134. Theology of Pentecostalism. An exploration of this tradition with examination of its distinctive emphases and interpretations of Christian faith. *Turner*

200. The Person and Work of Christ. The problem of knowledge of Christ and formulation of a doctrine of his work and person in the light of biblical eschatology. *Staff*

210. Contemporary British Theology. Selected problems in representative British theological writings after 1900. *Langford*

211. Authority in Theology. The idea and function of authority in theology. *Langford*

215. The Nature and Mission of the Church. Christian understanding of the Church—biblical, historical, contemporary—with a view toward ecumenical doctrinal construction. *Herzog*

216. Kierkegaard Studies. Critical examination of selected works. *Robinson*

220. Theological Explorations. A seminar on contemporary theological issues, content to be designated by the theological division. *Staff*

225. The Christian Understanding of Human Nature and Destiny. Representative historical and recent theological interpretations of human nature, predicament, deliverance, and possibility. *Richey*

226. Theology and Contemporary Secular Understandings of Man. Critical theological examination of selected current interpretations of human nature and the human situation. *Richey*

229. Tragedy and Christian Faith. An analytical and constructive philosophical interpretation of the fundamental tragic dimension of human life in the light of a Christian theological understanding. *Robinson*

272. Theology of Paul Tillich. An examination of Tillich's philosophical theology. *Robinson*

300. Systematic Theology. Method and structure of systematic theology, the doctrine of God, theological anthropology, and Christology. Prerequisite: CT 32 or equivalent. *Herzog or Langford*

303. Philosophical Method in Religious Studies. European hermeneutic (Gadamer) and American process philosophy (Whitehead and Hartshorne) as applied to Christian theology. *Herzog*

320. Theology, Power, and Justice. Critical examination of a major theme of modern thought in Schleiermacher, Hegel, Marx, and Tillich. *Herzog*

322. Nineteenth-Century European Theology. Protestant theology from Kant to Herrmann. *Herzog*

325. Philosophical Theology I. Selected readings from Plato and Aristotle which helped to shape philosophical theology from Origen through Augustine and Aquinas. *Herzog*

326. Philosophical Theology II. Main problems of philosophical theology in the modern period.

328. Twentieth-Century European Theology. Critical examination of the thought of selected Protestant theologians from 1900 to 1950. Prerequisite: CT 32. *Herzog*

352. Seminar in Christian Theology. Research and discussion of a selected problem in the systematic field. *Staff*

CHRISTIAN ETHICS

33. Christian Ethics. Theological assumptions, ethical principles, and their application to contemporary issues of Christian social policy. *Beach, Lacy, and H. Smith*

107. The Biblical Bases of Christian Ethics. Examination of major themes and moral teachings, principally in the Decalogue, the Gospels, and the Epistles, with application to some contemporary issues. Prerequisite: OT 11, NT 18, or equivalent. *H. Smith*

112. Technology and Christian Ethics. The impact of the technological revolution upon American culture, and a normative Christian response. *Beach*

113. Contemporary Issues in Christian Morals. Constructive examination of selected areas of public and private morality. *Staff*

130. Dying and Death. Critical consideration of biblical, legal, medical, and ethical perspectives. Prerequisites: OT 11, NT 18, or equivalents. *Bailey, H. Smith, and others*

136. Perspectives on Food and Hunger. An interdisciplinary symposium on national and world hunger and malnutrition, including (whenever possible) student involvement in local hunger-related agencies. *Lacy and others*

194. The Protestant Church and American Culture. Analysis from the perspective of Christian ethics of current problems in the interpretation of church and culture with explicit reference to the parish setting. *H. Smith*

220. Ethical Explorations. A seminar on contemporary ethical issues, the specific content in any given semester to be designated by the Theological Division. *Staff*

230. Moral and Value Education. A critical, theological investigation of Durkheim, Dewey, Simon, Kohlberg, Bull, Rokeach, and implications for education in church and society. Prerequisites: CHE 33 and CED 105. *H. Smith and Westerhoff*

242. Human Sexuality. Examination of biological, biblical, cultural, and other aspects of human sexuality, together with analytical and constructive interpretation. Permission of instructor required. *H. Smith*

244. Interdisciplinary Seminar in Medical-Legal-Ethical Issues. A seminar composed of students and faculty from the Medical, Law, and Divinity Schools for critical consideration of selected pertinent issues of mutual professional interest. Prerequisite: permission of instructor. *H. Smith and others*

245. Ethics in World Religions. Moral foundations, assumptions, and applications in such historic faiths as Hinduism, Buddhism, Confucianism, and Islam, in the light of Christian ethical perspectives. *Lacy*

262. Marxist Ideology and Christian Faith. Comparative examination of Communist and Christian doctrines such as man, society, sin, history and eschatology, together with an introduction to the contemporary dialogue. *Lacy*

290. Current Problems in Christian Social Ethics. A critical study of secularization, the technological revolution, and the ecological crisis. *Beach*

291. Historical Forms of Protestant Ethics. A survey of major types of Protestant ethical theory from Luther through contemporary figures. *Beach*

294. Christianity and the State. "Civil religion" in its historic development and contemporary expressions in America. Christian ethical premises of democratic political theory and practice. The relationships of church and state. *Beach*

383. Moral Theology in the Twentieth Century. Critical and comparative examination of ethical theory as exhibited in the work of selected contemporary theologians. *H. Smith*

387. Ethical Method. Selected methodological issues in contemporary theological ethics. *H. Smith*

388. Ethics and Health Care. A critical study of selected aspects of modern biomedical technology with special reference to the ethical assumptions informing their development and practice. *H. Smith*

389. Christian Ethics and Contemporary Culture. A study of the interaction between Christian thought and current secular social theory. *Beach*

BLACK CHURCH STUDIES

100. Introduction to Black Theology. An examination of the historical roots of black theology with special attention to the treatments of traditional themes and problems in theology by black theologians and their rationale for the black theological enterprise. *Turner*

124. The Black Church in America. A consideration of the historical and theological development of the separate black Christian denominations in America with attention to some of the major leaders, black worship, and black preaching. *Turner*

126. Black Religion and Social Conflicts in America. An examination of some of the reactions of black religious groups to the limits placed upon black people in American life, efforts made to break down racial barriers in society, and attempts to institutionalize black responses to such barriers. *Turner*

144. Selected Topics in Black Church History. An exploration of pivotal events, key issues, and persons in the development of the black church in America. Prerequisite: BCS 124 or permission of the instructor. *Newsome*

WORLD CHRISTIANITY AND ECUMENICS

124. The Christian World Mission. A study of theological foundations, guiding principles, and contemporary problems of the world Christian community. *Lacy*

133. The Expansion of Christianity. A survey of the spread of Christianity and the growth of the worldwide Church with special emphasis on nineteenth- and twentieth-century Protestantism in the non-Western world. *Lacy*

135. Contemporary Issues in the World Church. Analysis of political, social, cultural, and religious conditions in a selected area of the world, and of theological-ethical insights and perspectives within the indigenous Christian community. *Lacy*

137. Third World Theology. An examination of selected theological writings from Asia, Africa, and Latin America, comparing their perspectives and their unique contributions with the contemporary Christian thought. *Lacy*

156. The Ecumenical Movement. Its contemporary development, structures, activities, and problems, against the background of Church unity and disunity. *Lacy*

386. Christianity in Dialogue with Other Faiths. Contemporary currents of Christian thought as they relate to resurgent non-Christian religions and involve new formulations of a theology of mission. *Lacy*

IV. Ministerial Studies

THE CARE OF THE PARISH

128. Ministerial Leadership and Participative Skills. A study of the pastor's role as participant-facilitator with attention to organizational theory and facilitative skills employing the group workshop method of learning. *Ingram*

129. The Pastor as Consultant to Church Organizations. A consideration of the pastor's role as organizational consultant with special emphasis on data gathering, diagnosis, and intervention using experiential learning designs. *Ingram*

130. Planning and Directing the Church's Program. Principles of planning, organizing, staffing, directing, and evaluating the program of the local church. *Ingram*

142. Women and Ministry. Theological and practical issues related to women and ministry. *Staff*

147. The Pastoral Responsibility for Administration. A consideration of the major responsibilities of the pastor in the administration of the local church. *Ingram*

148. Christian Stewardship and Church Finance. A seminar to consider the principles of stewardship, education, budget-making, enlistment in church support and church financial management in theological perspective. *Ingram*

150. Church and Community. The structure and dynamic factors shaping the present-day community together with their import for the work of the church. *Wilson*

151. The Town and Country Church. The small church, the circuit church, circuit administration, larger parish and group ministry, and the town and country movement. *Wilson*

152. Evangelism As a Pastoral Concern. A study of the nature, purposes, and methods of contemporary Christian evangelism with special attention to the local church. *Ingram*

154. The Urban Church. The function, nature, program, and administration of the effective city church and of the urban minister's distinctive task. *Wilson*

155. Church Polity.

155B. The Baptist Churches

155C. The United Church of Christ

155D. The Presbyterian Churches

157. The Church and Social Change. A sociological study of the relationship of the Church to the process of social change, including the role of the Church as innovator, the Church as participant in social movements, method(s) of accomplishing change, and the religious leader as an agent of social change. *Wilson*

158. Contemporary Religious Sects. The nature, ideology, development, clientele, and role of contemporary religious sects; the process by which such sects develop into established organizations; and their relationship to the mainline churches. *Wilson*

159. Early Methodism: History, Theology, and Polity. A study of the character and development of Methodism, beginning with John Wesley and tracing important features of this tradition through the nineteenth century. *Langford, Richey, and Wilson*

160. Twentieth-Century Methodism: History, Theology, and Polity. The development of the United Methodist Church, focusing on theological diversity and patterns of organizational life, with major concentration on the polity of this church as provided by the current *Discipline*. *Langford, Richey, and Wilson*

179. Church Research. Methods of research and survey for the gathering, analysis, and interpretation of church and community data, together with preparation and use of denominational statistics. *Wilson*

189. The Multiple Staff Ministry. Group work, leadership, and organizational theories as applied to staff ministries in large church and cooperative parish settings. *Ingram*

220. Seminar in Contemporary Ministries. A seminar in patterns and issues of contemporary ministries, content to be designated by the Ministerial Division. *Staff*

CHRISTIAN EDUCATION

101. Faith and Nurture. Foundations in theology and educational theory for the teaching ministry of the Christian community. *Richey*

105. Education as a Pastoral Ministry. The nature of religious communities and the means by which they evolve, sustain, and transmit faith, values, and ways of life, with implications for evaluating, planning, and designing educational experiences within the total life of a congregation. *Westerhoff*

167. Adult Education and the Ministry of the Laity. A study of adult education and the ministry and mission of the laity in Church and world and the ministry of teaching in the lay renewal of the Church. *Richey*

169. Major Issues in Christian Education. Critical examination of selected issues in Christian education. *Richey*

175. Liturgy and Education. The nature and role of rites and rituals; learning, prayer, and the spiritual life; and education for baptism, confirmation, and the eucharist. *Westerhoff and staff*

185. Religious Education and the Arts. The place and the effect of imagination in religion and education, and the use of the arts in religious education. *Westerhoff*

190. Pastor as Teacher. An applied course in the teaching-learning process and models, strategies, and methods for planning and designing education in the parish. *Westerhoff*

192. Ethnicity and the Church's Mission and Ministry. Applying the insights of cultural anthropology to evangelization and nurture. *Westerhoff*

193. Living Faiths and Christian Education. An exploration of Christian education in the light of the faiths of other persons with special attention to Judaism. *Westerhoff*

218. Research Seminar in Religion and Education. Various research techniques applied to issues in religion and education. Prerequisite: permission of instructor. *Westerhoff*

220. Colloquium in Religious Education. *Staff*

230. Moral and Value Education. A critical, theological investigation of Durkheim, Dewey, Simon, Kohlberg, Bull, Rokeach, and implications for education in church and society. Prerequisites: CHE 33 and CED 105. *H. Smith and Westerhoff*

231. Pastor as Spiritual Guide. An introduction to spirituality and spiritual formation as aspects of the Church's educational ministry. *Westerhoff*

PASTORAL PSYCHOLOGY

70. Group Process and Personal Identity. A small group experience to enhance personal growth and explore personal identity and interpersonal styles of relating. *Staff*

164. Pastoral Counseling in a Parish Setting. Group supervision of pastoral counseling in a local parish setting. Verbatim materials from counseling sessions will be utilized. Prerequisite: permission of instructor. *Mickey*

170. Pastoral Conversation. A consideration of the nature of the pastor's conversation with people in the total caring ministry grounded in the person-centered understanding of personality processes and human relationship, using textual and conversational materials. *Goodling*

171. Pastoral Counseling. Consideration of the structures and processes of pastoral counseling; pastoral evaluation, referral, intake contract, goals, transference, termination, and other special problems. Prerequisite: permission of instructor. *Goodling*

172. Pastoral Care in Marriage and Family Life. Pastoral care in marriage and family life with special emphasis on premarital guidance within the context of the local church's program of family life education. *Goodling*

173. Psychotherapy and Sanctification. An analysis of structuring and growth processes in psychotherapy in the light of a Christian understanding of sanctification. *Mickey*

174. Theology and Personality Processes. Theological and religious interpretations of basic human experiences; psychodynamic meanings of theological relationships, religious practices, and personality development. *Mickey*

175. Pastoral Care Ministries in Critical Human Situations. A seminar utilizing lectures by visiting professionals, case materials, resource films, and readings, to inform ministers on the casual factors, behavioral patterns, preventive and treatment programs, and the role of the church and minister in such problems as alcoholism, drug addiction, dying and death, juvenile offenses, marital crisis, suicide, mental retardation, sexual deviation, psychiatric disorders. *Goodling*

175A. Special Practicum Projects. For advanced students who want additional clinical experience under supervision in a pastoral care setting (inner-city; alcoholic rehabilitation; counseling; etc.). *Staff*

176. Pastoral Care and Persons in Institutions.

176B. Lectures by staff and ward visits at the Murdoch Center for the Mentally Retarded and the facilities in the Butner, North Carolina, complex (state hospital, alcoholic rehabilitation, training school). *Staff*

176C. Lectures by staff and ward visits at the Central Prison in Raleigh and related correctional facilities. *Staff*

176D. The Church's ministry to the elderly and homebound explored through lectures, case conferences, and visits to the elderly and homebound parishioners of local Durham churches. *Goodling*

177. Pastoral Care in the General Hospital Setting. An examination through intensive individual and group supervision, of the student's pastoral ministry to the ill, the dying, and the bereaved in the general hospital setting. (Not recommended for those planning to take PP 277.) *Staff*

178. Power and Restraint in the Parish. A theological analysis of psychopolitical dynamics of the local church. Verbatim materials from the student's church work will be utilized in the course. *Mickey*

180. Women and Pastoral Psychology. A seminar utilizing lecture-discussions by visiting professionals, case materials, and shared research dealing with feminine psychology, the relationship of culture to counseling, and the dynamics of sexuality in counseling. *Mickey*

271. Marriage and Family. The psychodynamics of marital conflict and family problems; principles and procedures in marriage and family counseling. (For seniors and Th.M. candidates.) *Staff*

273. Seminar in Pastoral Theology: Theological Dimensions of Pastoral Counseling. An investigation of the problems in relating materials from theology and the social sciences as they are found in pastoral theology. *Mickey*

275. Individual Study in Pastoral Psychology. Selected readings in major issues in pastoral psychology issuing in a research or honors paper. *Staff*

277-A,B,C. Basic Clinical Pastoral Education. Units of Basic CPE offered in the summer, fall, and spring in programs accredited by ACPE. (Two course units each, maximum credit.) *Staff*

278. Psychological Theories of Personality. A systematic presentation of leading personality theories, with reference to developmental processes (motivation, cognition, learning, etc.) and their implications for Christian ministry. *Mickey*

281-A,B,C. Advanced Clinical Pastoral Education in Pastoral Care and Counseling. Pastoral care with inpatients and pastoral counseling of individuals, couples, families, and groups in a pastoral counseling center. (Two course units each.) *Staff*

PREACHING

30. Theology and Practice of Preaching. The development of a theology of preaching and methods of sermon construction, including preaching in class, critique, private conference, and local church evaluation. Prerequisite: OT 11 or NT 18 or permission of instructor. *Lischer*

161. Preaching and the Church Year. Preaching the lectionary texts in the context of the church's worship and calendar. The appropriate cycle of the COCU lectionary will be followed. *Lischer*

162. The Rhetoric of Preaching. Literary forms in biblical and nonbiblical literature as components of and models for preaching. Metaphor, poem, parable, story, and dialogue in oral-aural communication. Prerequisite: OT 11 or NT 18. *Lischer*

163. Theologies of Preaching. A survey of significant theories of preaching from Augustine to the present, including analysis of the theological and rhetorical components of the sermon as they are described in representative treatises on preaching. Prerequisite: PR 30 or permission of instructor. *Lischer*

165. Preaching as Public Address. A workshop on preaching and worship leadership organized around the principles of speech and effective communication. Extensive use of audio-visual recordings and private conferences. Prerequisite: PR 30 or permission of instructor. *Lischer*

180. From Text to Sermon. Preaching from Biblical sources. Emphasis upon the goal and methodology of exegesis, the hermeneutic problem, and verbal communication in the present. Prerequisite: OT 11 and NT 18. *Staff*

181. Advanced Sermon Analysis Seminar. A critical study, on the basis of selected sermons and student presentations, of principal and practical problems facing the contemporary preacher. *Staff*

182. Advanced Preaching: Practice and Evaluation. An advanced laboratory course for extra competence in the preparation, delivery, and evaluation of sermons. Prerequisite: PR 30 and permission of instructor. *Lischer and staff*

183. Preaching in the Black Community. A study of the style and content of black preaching with attention to the unique roles of black preachers in society. An analysis of the essential characteristic of preaching in the black church. *Staff*

186. Twentieth-Century Preaching. A study of contemporary preaching based on printed, recorded, audio- and video-taped sermons of leading homiletics of our age. *Staff*

187. Pre-Reformation Preaching. Sermons, handbooks, and other historical sources studied in relation to biblical preaching and the liturgical church, the problem of popular ministry, and the issues of Christian reform. Prerequisite: CH 13. *Lischer and staff*

188. Post-Reformation Preaching. A study of the theological trends and significant personalities in the preaching tradition from the sixteenth century to the present. *Lischer and staff*

193. Theology and Preaching. An examination of the relation of systematic theology and homiletical presentation. *Lischer*

196. Preaching in the Parish. A consideration of preaching in relationship to pastoral duties and the total task of ministry with attention to week-by-week preaching in the parish setting. Some attention will be given to funerals and crisis situations. *Staff*

WORSHIP AND CHURCH MUSIC

166. Worship as a Pastoral Concern. A practical course dealing with worship as an expression of a pastor's concern for Christian education, pastoral care, evangelism, theology, and social action. Opportunity will be given for students to evaluate themselves as worship leaders. *Staff*

167. Baptism and the Lord's Supper. Study of these sacraments with attention given to major representative traditions and to varieties of present observance and practice. *Staff*

168. Worship in the Wesleyan Tradition. The history, development, and current trends in United Methodist worship along with practical experience and concerns related to worship leadership in United Methodist churches. *Staff*

178. Christian Worship. A survey of the history of Christian corporate worship. Examination of the major biblical, historical, and theological developments in worship from Old Testament times to the present. Readings in liturgical thought through the ages with comparative study of selected liturgical traditions. *Staff*

180. Church Music. A two-fold study including: (1) a survey of the great monuments of church music; (2) musicianship, song-leading, and basic conducting with an emphasis upon the selection and use of hymns and other music from the *Methodist Hymnal* in public worship. *Staff*

184. New Forms of Worship. Workshop in corporate worship as central in the liturgical life of the church, and of both traditional and innovative means of communication, celebration, and witness, through shared experiences in multimedia center, field visits, and mini-workshops with resource persons in the various media. *Staff*

250. Advanced Seminar in Liturgical Studies. Reading and research in a selected area of liturgical study to be announced. *Staff*

251. Studies in Spirituality. A consideration of different dimensions of the spiritual life. *Staff*

V. Clinical Training and Internships

CLINICAL TRAINING IN PASTORAL PSYCHOLOGY

Students may earn up to two course credits for a quarter or unit of clinical pastoral education in programs accredited by the Association for Clinical Pastoral Education (ACPE).

Students involved in clinical training under the direct supervision of members of the pastoral psychology staff during the academic year should register for credit under PP 277 for two course units unless a course credit has already been received for PP 177, in which case only one rather than two credits will be granted for the CPE quarter. Students should apply for such training through the Director of Clinical Pastoral Education.

Students involved in clinical training in summer CPE quarters should register with ACPE and the Associate Dean for Curricular Affairs as soon as accepted for training by a chaplain supervisor. Upon the receipt of a supervisor's report at the end of the training period the student will receive two course units of transfer credit.

INTERNSHIPS

In consultation with the Director of Field Education and the Associate Dean for Curricular Affairs, an individually designed internship may be developed in a particular ministerial vocational area of interest. Under certain circumstances it may be possible to earn one unit of field education and two course credits through such internships. Such programs must be formulated and recorded in advance in the offices of both field education and curricular affairs.

125–126. Special Ministry Internship. When a student needs to develop professional competencies in a highly specialized form of ministry, the Director of Field Education will assist in designing an appropriate learning contract and in negotiating for a suitable placement setting, provided the arrangements meet the basic criteria approved by the Field Education Committee.

131–132. Ministry through Social Agency Internship. A twelve-month placement in a regular personnel position in a social service agency to meet the job description of the agency and to develop a personal mode and style of ministry in a secular setting through understanding, appreciation, involvement in, and critical theological

reflection upon environment, structures, values, and decision-making processes as conveyed by the conduct of the agency.

137–138. Parish Ministry Internship. A twelve-month placement, individually designed to engage the student in specified learnings in a wide variety of ministry functions in a local parish, under qualified supervision and using the guidelines of a learning contract.

143–144. Campus Ministry Internship. A nine-to twelve-month placement in approved locations designed to provide special learnings in delivering a ministry to college students under qualified guidance and utilizing a learning contract which specifies seminars, a personal journal, directed reading, and consultations to develop competency in these functions.

175–176. Clinical Pastoral Education Internship. A twelve-month placement in a clinical program accredited by the Association for Clinical Pastoral Education (ACPE).

197–198. Mission Internship. A special internship to prepare for service in church missions may be arranged by enlisting in the national or overseas program of the United Methodist Board of Global Ministries for one to three years. As a requirement for agency planning, applications should be initiated in the fall of the middler year. Other denominational and/or work-study experiences abroad may be given field education credit by special arrangement with the Director of Field Education.



Department of Religion—Graduate Courses

The following courses are offered periodically in the Graduate Department of Religion by Department of Religion faculty and may be taken by divinity students with permission of the instructor.

- 217. Islam in India
- 219. Augustine
- 221. Reading in Hebrew Biblical Commentaries
- 230. The Meaning of Religious Language
- 231. Seminar in Christianity and Contemporary Thought
- 233. Modern Narrative and Religious Language
- 243. The Archaeology of Palestine in Biblical Times
- 244. The Archaeology of Palestine in Hellenistic-Roman Times
- 248. The Theology of Karl Barth
- 252. Nineteenth- and Twentieth-Century Roman Catholic Theology
- 254. Introduction to African Religions
- 255. Seminar in African Religions
- 258. Coptic
- 264. The Sociology of the Black Church
- 265. The Religions of the West Africa Diaspora
- 280. The History of Religions
- 281. Phenomenology and Religion
- 284. The Religion and History of Islam
- 301. Seminar in Contemporary Christian Ethics
- 302. Studies in Intertestamental Literature
- 304. Aramaic
- 304A. Targumic Aramaic
- 306. Language and Literature of the Dead Sea Scrolls
- 310. Readings in Judaica
- 323. A-B. Comparative Semitic I-II
- 324. Readings in the History of Religion
- 360. Special Problems in Religion and Culture
- 370. Seminar in Religion and Literature
- 380. Existentialist Thought

Appendix

ENROLLMENT SUMMARY 1982-83

Divinity School Students, total 370

323	M.Div.	(244 men, 79 women)
6	M.R.E.	(6 women)
11	Th.M.	(10 men, 1 woman)
30	Special	
	Students	(17 men, 13 women)

Graduate Division of Religion Students, total 55

4	M.A./Ph.D.
51	Ph.D.

Total: 414

DENOMINATIONS REPRESENTED 1982-83

United Methodist	273	Pentecostal	2
Episcopal	9	Roman Catholic	2
Presbyterian Church of the U.S.	9	Evangelical Methodist	1
United Church of Christ	9	Evangelische Kirche Der Union	1
Southern Baptist	8	Freewill Baptist	1
Lutheran Church in America	6	Mennonite	1
Disciples of Christ	4	Moravian	1
African Methodist Episcopal	3	National Baptist	1
Christian Methodist Episcopal	3	Presbyterian	1
Missionary Baptist	3	Seventh-Day Adventists	1
United Presbyterian	3	Society of Friends	1
American Baptist	2	Southern African Baptist Union	1
African Methodist Episcopal Zion	2	United Church in Australia	1
Baptist	2	United Holy Church	1
Church of the Nazarene	2		

GEOGRAPHICAL DISTRIBUTION 1982-83

North Carolina	170	Minnesota	3
Virginia	29	New Jersey	2
Florida	23	Iowa	2
South Carolina	15	Oklahoma	2
Tennessee	11	Colorado	1
Arkansas	10	Delaware	1
Indiana	10	Hawaii	1
Illinois	9	Kansas	1
Alabama	8	Nebraska	1
West Virginia	8	New Mexico	1
Maryland	7	Rhode Island	1
Ohio	6	South Dakota	1
Texas	6	Wisconsin	1
Kentucky	4	Foreign:	
Massachusetts	1	Australia	1
New York	4	Chile	1
Pennsylvania	4	Ghana	1
California	3	South Africa	1
Georgia	3	West Germany	1
Michigan	3		

INSTITUTIONS REPRESENTED

Agnes Scott College	1	Harvard University	2
Alabama State University	1	Hendrix College	7
Albion College	2	High Point College	9
American Baptist College	1	Hollins College	1
American University of Beirut	1	Huntingdon College	9
Andrews University	2	Indiana Central University	1
Appalachian State University	3	Indiana State University	1
Asbury College	4	Indiana University	1
Atlantic Christian College	7	International College	1
Augustana College	1	Iowa State University	1
Averett College	2	Iowa Wesleyan College	1
Ball State University	1	James Madison University	1
Barrington College	1	John Wesley College	1
Beaver College	1	Lagrange College	1
Belmont Abbey College	1	Lambuth College	3
Berea College	3	Lenoir Rhyne College	4
Berry College	1	Livingstone College	1
Birmingham-Southern College	1	Longwood College	1
Boston University	2	Los Angeles Baptist College	1
Bucknell University	1	Lutheran Theological Southern Seminary	2
California State University	1	Lutheran School of Theology	1
Campbell University	1	Lynchburg College	1
Campbell School of Law	1	Mars Hill College	3
Carl-Duiseburg Gymnasium	1	Marshall University	2
Carleton College	1	Mary Baldwin College	1
Central Michigan University	1	Massachusetts Institute of Technology	1
Central Wesleyan College	1	McMurray College	1
Centre College	1	Memphis State University	1
Citadel College	1	Methodist College	11
Claflin College	1	Meredith College	2
Clemson University	3	Middle Tennessee State University	1
Colorado College	1	Miles College	2
Columbia Bible College	1	Mobile College	1
Columbia School of Bible	1	Muhlenburg College	1
Columbus College	1	Nazerene Theological Seminary	1
Converse College	1	Nebraska Wesleyan University	1
Cumberland College	1	New Mexico State University	1
Davidson College	4	North Carolina Agricultural and Technical State University	2
DePauw University	8	North Carolina Central University	2
Duke University	17	North Carolina State University	6
Duke University-Divinity School	7	North Carolina Wesleyan College	4
East Carolina University	1	Northern Illinois University	2
Eastern Mennonite College	2	Northwestern University	1
Eckerd College	1	Oakwood College	2
Elon College	3	Ohio State University	1
Emory and Henry College	6	Ohio Wesleyan University	1
Erskine Theological Seminary	1	Oklahoma City University	1
Fairmont State College	1	Old Dominion University	1
Fayetteville State University	3	Quachita Baptist College	1
Ferrum College	2	Paine College	1
Florida Atlantic University	1	Pembroke State University	4
Florida Southern College	2	Pennsylvania State University	2
Florida State University	7	Pepperdine University	1
Francis Marion College	1	Pfeiffer College	9
Frostburg State College	1	Queens College	2
Furman University	3	Radford College	2
Grambling State University	1	Randolph-Macon Women's College	1
Grand View Hospital School of Nursing	1	Rutgers University	1
Greensboro College	5	Sam Houston State University	1
Greenville College	1	San Francisco Theological Seminary	1
Grove City College	1	Scarritt College	1
Guilford College	1	Seton Hall University	1
Gustavus Adolphus College	1	Shaw University	2
Hampton Institute	1		

Smith College	1	University of North Carolina-Greensboro	8
Southeastern College	1	University of North Carolina-Wilmington	4
Southeastern Theological Seminary	1	University of Pennsylvania	1
Southern Methodist University	1	University of Richmond	1
Southwestern at Memphis	1	University of South Carolina	1
St. Andrews Presbyterian College	4	University of South Carolina-Aiken	1
Stetson University	1	University of South Florida	1
St. Olaf College	1	University of Virginia	4
Tennessee Wesleyan College	1	University of Virginia-Clync Valley College	1
Trevecca Nazarene College	2	University of West Florida	1
Trinity University	2	University of Western Cape	1
Tulane University	1	University of Wisconsin	2
Union Theological Seminary	1	Valparaiso University	2
Union University	1	Virginia Commonwealth University	1
United States Coast Guard Academy	1	Virginia Polytechnic Institute	
University of Adelaide	1	and State University	3
University of Alabama	1	Virginia Theological Seminary	1
University of Alabama-Birmingham	1	Virginia Wesleyan College	3
University of Arkansas	3	Wake Forest University	11
University of California-Santa Cruz	1	Washington and Lee University	1
University of Denver	1	Wellesley College	1
University of Florida	2	West Virginia University	1
University of Georgia	1	West Virginia Wesleyan College	3
University of Houston	1	Western College University	2
University of Kansas	2	Wilberforce University	1
University of Maryland	2	William and Mary, College of	7
University of North Alabama	1	Winthrop College	1
University of North Carolina-Asheville	1	Wofford College	4
University of North Carolina-Chapel Hill	17	Wright State University	1
University of North Carolina-Charlotte	6		

ENROLLMENT 1982-83

Candidates for the Master of Divinity Degree

Adams, Anslem Snow (A.S., Montreat Anderson College; B.A., University of North Carolina—Asheville), Asheville, North Carolina

Admire, Charles Allen (B.A., Campbell University), Coats, North Carolina

Albert, Timothy Mark (B.A., High Point College), Asheboro, North Carolina

Allebaugh, Terry Lee (B.A., Berea College), Harrisonburg, Virginia

Allred, Susan Lutz (B.A., Greensboro College), Chapel Hill, North Carolina

Amundsen, Claire Ann (B.A., Florida State University), Seffner, Florida

Anderson, Howard Emory, III (B.A., Methodist College) Wilmington, Delaware

Andrews, Richard Willard (B.S., Frostburg State College), Frederick, Maryland

Angel, Andrew Stephen (B.A., Ohio State University), Sunbury, Ohio

Armstrong, Kevin R. (B.A., DePauw University), Washington, Indiana

Aspenon, David Orland (B.A., Northern Illinois University), Belvidere, Illinois

Atkinson, David Glenn (B.S., Lambuth College), Halls, Tennessee

Atkinson, Julia A. (B.A., Augustana College), Rock Island, Illinois

Auman, Timothy Lewis (B.A., Wofford College), High Point, North Carolina

Austin, Stephen Williams (A.B., Davidson College), Shelby, North Carolina

Barr, Jason Aristotle, Jr. (B.A., M.A., University of Florida), Jacksonville, Florida

Bartlett, Robert Polk (A.A., Seminole Junior College; B.A., Stetson University), Orange, Florida

Beal, Roger Keith (B.A., Hendrix College), Conway, Arkansas

Beasley, Cynthia Frances (A.A., Anderson College; A.B., Wofford College), Anderson, South Carolina

Bickerton, Thomas James (B.A., West Virginia Wesleyan College), Moundsville, West Virginia

Biniore, Nancy D. (B.A., Hendrix College), Little Rock, Arkansas

Bishop, Mary Beth (B.A., Colorado College), Houston, Texas

Blair, B. Ann (B.A., Radford College), Wytheville, Virginia

Blanchard, Diane Marie Christianson (B.A., Carleton College), St. Paul, Minnesota

Blanchard, Randy Coy (B.A., Methodist College), Durham, North Carolina

Bland, Linda Adams (B.A., M.A., Wake Forest University; M.A.T., Duke University), Elon College, North Carolina

Bond, Luther Grant, II (A.A., Roxbury Community College; B.S., Ferrum Senior College), Baltimore, Maryland

Bone, Jesse Virgil, Jr. (B.A., University of North Carolina—Chapel Hill), Chapel Hill, North Carolina

Bowden, Reuben Lawrence (B.A., Huntingdon College), Brundidge, Alabama
 Bradley, Neil Anthony (B.G.S., University of Maryland; M.Ed., University of Virginia), Barboursville, Kentucky
 Brame, Carl James, Jr. (B.A., Atlantic Christian College), Eden, North Carolina
 Briggs, Edwin Albert, Jr. (B.A., Emory and Henry College), Roanoke, Virginia
 Brown, Michael Timothy (A.A., Truett-McConnell College; A.B., LaGrange College), Albany, Georgia
 Brown, Norman Aaron (B.A., Claflin College), Bennettsville, South Carolina
 Brunson, Jesse (B.A., St. Andrews Presbyterian College), Rowland, North Carolina
 Bryant, Barry Edward (A.B., Trevecca Nazarene College), Nashville, Tennessee
 Bubb, David L. (B.A., Centre College), Erlanger, Kentucky
 Buchanan, Terry Lee (B.A., Eckerd College), Clearwater, Florida
 Buckrham, Clifton C. (B.A., Shaw University), Raleigh, North Carolina
 Burcher, Michelle Dickerson (B.S., College of William and Mary), Sparta, North Carolina
 Burchill, Timothy W. (B.A., DePauw University), Oak Park, Illinois
 Burgess, Susan Lucille (B.A., Methodist College), Rockville, Maryland
 Burton, J. Matthew, Jr. (B.M., Greensboro College), Greensboro, North Carolina
 Campbell, Heidi Lou (B.A., College of William and Mary), Virginia Beach, Virginia
 Carter, Kenneth (B.S., Columbus College), Kernersville, North Carolina
 Carter, Pamela B. (B.A., Wake Forest University), Kernersville, North Carolina
 Cartwright, Mary Wilder (B.A., Hendrix College), Forrest City, Arkansas
 Cartwright, Michael Glen (B.A., Hendrix College), Fort Smith, Arkansas
 Chaffin, Ethel Tison (A.B., University of Georgia—Albany), Durham, North Carolina
 Chamberlain, Edwin Rhett (B.A., Wake Forest University), Durham, North Carolina
 Cheezem, Paul Milton (B.A., Clemson University), Ruby, South Carolina
 Childress, Edwin Minter (B.A., University of Virginia), Martinsville, Virginia
 Church, Clint James (A.A., Wilkes Community College; B.S., Appalachian State University), West Jefferson, North Carolina
 Cirulis, Marilyn Hull (B.A., University of North Carolina—Greensboro), High Point, North Carolina
 Clarkson, Julie Cuthbertson (B.A., Agnes Scott College), Charlotte, North Carolina
 Clem, C. Dale (B.A., Birmingham—Southern College), Huntsville, Alabama
 Clive, Mary Alene (B.A., North Carolina State University), Cary, North Carolina
 Cobb, Arnold Gene (B.A., University of North Carolina—Chapel Hill), Halifax, North Carolina
 Collins, Gerald David (B.S., Western Carolina University), Burlington, North Carolina
 Collins, Joseph William (B.A., University of North Carolina—Charlotte), Charlotte, North Carolina
 Combs, Ronald Kevin (B.S., Emory and Henry College), Durham, North Carolina
 Combs, Sallie Walls (B.A., Emory and Henry College), Knoxville, Tennessee
 Conger, Steven Marshall (B.A., North Illinois University), Downers Grove, Illinois
 Cooper, Charles Randall (B.A., University of Arkansas), Mansfield, Arkansas
 Copeland, John Mark (B.A., Berea College), Suffolk, Virginia
 Cottrell, Peter Lee (B.A., Florida Southern College), Cocoa, Florida
 Countiss, James Robert (B.A., Emory and Henry College), Bristol, Virginia
 Crabtree, Wade William (B.A., Southeastern College), Burlington, North Carolina
 Cresson, Lisa Meadors (B.A., Randolph-Macon Women's College), Memphis, Tennessee
 Cribb, Jerry Wayne (B.A., Methodist College), Rockingham, North Carolina
 Crowell, William George (B.A., Oklahoma City University), Oklahoma City, Oklahoma
 *Cummings, Simeon Dufrene (B.A., Pembroke State University), Pembroke, North Carolina
 Daniels, Robert Lee (B.A., American Baptist College), Grant Town, West Virginia
 Davis, Eldrick Ray (B.A., St. Andrews Presbyterian College), Maxton, North Carolina
 DeLoach, Travis Lee (B.A., Averett College), Danville, Virginia
 Derreth, Richard Joseph (B.A., Central Wesleyan College), Beaufort, North Carolina
 Disher, Eric Dean (B.A., University of North Carolina—Charlotte), Whitsett, North Carolina
 Downin, Jeffrey Preston (B.A., Washington and Lee University), Hagerstown, Maryland
 Drake, Victoria K. Jamieson (B.A., Wellesley College), Toledo, Ohio
 Elkins, Edgar George (B.A.S., Methodist College), Fayetteville, North Carolina
 Elliot, Stephen Paul (B.A., DePauw University), East Chicago, Indiana
 Ellis, Steven Bruce (B.S., University of North Carolina—Chapel Hill) Greensboro, North Carolina
 Elwell, William Earl (B.A., Huntingdon College), New Hope, Alabama
 Endress, Scott William (B.A., Trinity University), Lakewood, Ohio
 Evans, Timothy Harris (B.S., Florida State University), Colorado Springs, Colorado
 Evans, Tommy Lewis (A.A., Mt. Olive College; B.A., Atlantic Christian College), New Bern, North Carolina
 Everett, Glenn Bates (B.A., North Carolina Wesleyan), Havelock, North Carolina
 Fairley, Leonard E. (B.A., Pfeiffer College), Wayram, North Carolina

*Completed graduation requirements in December 1982.

Farabee, David Clark (B.A., University of Virginia), Plant City, Florida
 Ferraro, Thomas (B.A., Averett College), Alton, North Carolina
 Fitch, Michael Gibson (B.A., Ohio Wesleyan University; M.A., Case Western Reserve University), Durham, North Carolina
 Flair, Joseph William (B.A., University of North Carolina–Chapel Hill), Chapel Hill, North Carolina
 Fletcher, Carey Roberts (A.B., Harvard University), Champaign, Illinois
 Fouts, James Ralph (B.S., Ph.D., Northwestern University) Chapel Hill, North Carolina
 Fox, Dennis Edward (B.A., Clinch Valley College) Hillsborough, North Carolina
 Francis, David Henry (A.S., Mount Olive College; B.A., Atlantic Christian College), Bynum, North Carolina
 Frazier, Robert Carl (A.B., Atlantic Christian College), Wilson, North Carolina
 Fricks, Susan D'Arcy (A.B., Smith College), Cary, North Carolina
 Futterer, John Windus (B.A., University of North Carolina–Charlotte), Rockingham, North Carolina
 Gabriel, Bradley Wright (B.A., M.A., Memphis State University), Memphis, Tennessee
 Gales, Alvester Ivey (B.S., North Carolina Agricultural and Technical State University), Marston, North Carolina
 Gates, Lawrence Theodore (B.A., Florida State University), Temple Terrace, Florida
 Gilbert, Floyd Renot (B.A., Paine College), Hodges, South Carolina
 Gleaves, Edith Lee (B.A., Wake Forest University), Maxton, North Carolina
 Gourley, Caroline Burgin (A.B., Queens College), Statesville, North Carolina
 Gregory, Richard St. Clair (A.A., Wytheville Community College; B.A. Emory and Henry College), Max Meadows, Virginia
 Griffiths, Glenn Sherer (B.A., Pfeiffer College), Wadesboro, North Carolina
 Groover, Brian H. (B.S., B.A., Lynchburg College), McLean, Virginia
 Grosse, Frederick George (B.S., Pennsylvania State University), Malibu, Hawaii
 *Guyer, William Mark (B.A., Davidson College), Walkertown, North Carolina
 *Gyamfi, Henry Kofi (B.A., St. Andrews College), Kumasi, Ghana
 Hall, Winifred Louise (B.A., University of North Carolina–Greensboro; M.Ed., University of North Carolina–Chapel Hill), Durham, North Carolina
 Hamby, Joe Allen (B.A., Wake Forest University), Charlotte, North Carolina
 Hardt, Otto Henry Carl (B.S.C., International College; B.A., North Carolina Wesleyan College), Seven Springs, North Carolina
 Hardy-Robertson, Sallye (B.A., Asbury College), Madison Heights, Virginia
 Hargraves, James Stanley (B.A., Emory and Henry College), Athens, Tennessee
 Harp, Kenneth Earl (B.S., Cumberland College), Corbin, Kentucky
 Harrell, Charles LaBre (B.A., James Madison University), Camp Springs, Maryland
 Harris, Neal Ralph (A.A., Modesto Junior College; B.A., University of California–Santa Cruz), Modesto, California
 Harsh, Susan Lynn (B.A., Wright State University; A.B.D., University of North Carolina), Durham, North Carolina
 Haugh, Kelly Ann (B.A., Furman University), Annandale, Virginia
 Haughee-Bartlett, Judith Kay (B.A., M.A., Wake Forest University), Rockville, Indiana
 Hawkins, George Carver (B.S., M.S., Alabama State University), Raleigh, North Carolina
 *Hazen, Timothy J. (B.A., University of West Florida), Pensacola, Florida
 *Helms, Suzanna Ross (A.B., Hollins College), Raleigh, North Carolina
 Higgins, Leonard Ray (B.A., Hendrix College), Little Rock, Arkansas
 Hillman, Edgar Lafayette, III (B.A., Wofford College), Charlotte, North Carolina
 Hinson, Maurice E. (A.A., Florida State University; B.A., Huntingdon College), Demopolis, Alabama
 Hitch, Gervase Craig (A.B., Asbury College; M.Ed.Ad., Western Carolina University), Wilmore, Kentucky
 Hodgkinson, Lois Lann (B.A., Muhlenberg College), Buchanan, New York
 Holder, William Michael (B.A., Wofford College), Waynesville, North Carolina
 *Holland, Arthur Robert (B.A., High Point College), Polkville, North Carolina
 Hooper, Kay (B.A., Iowa Wesleyan College), Indianola, Iowa
 Hopkins, Edward Allman (B.A., College of William and Mary), Roanoke, Virginia
 Horton, Kimberly Ann (A.A., Cottey College; B.S., Rutgers University), Memphis, Tennessee
 Hoyt, Sally Dean (B.A., St. Olaf College), Minneapolis, Minnesota
 Huffstetler, David Boyce (B.A., University of North Carolina–Charlotte), Charlotte, North Carolina
 Hunnings, Bess Gibbs (B.A., Atlantic Christian College), Middleburg, North Carolina
 Hunt, David Earl (B.A., North Carolina State University), Pembroke, North Carolina
 Huskins, James Richard (B.A., North Carolina Wesleyan College), Thomasville, North Carolina
 Hutcherson, Carl B., Jr. (A.A., John Tyler Community College; B.S., Hampton Institute), Lynchburg, Virginia
 Isbell, Harriet Brown (A.B., Queens College), Jacksonville, Florida
 Isenhour, Gregory Lee (B.A., Asbury College), Kannapolis, North Carolina
 Jackson, Richard Carnell (B.A., Fayetteville State University), Fayetteville, North Carolina

Jasper, David Edward (B.A., Fairmont State College), Oak Hill, West Virginia
 Johnsen, Paul Douglas (B.S., University of Wisconsin–Madison), Madison, Wisconsin
 Johnsen, Sarah Hart (B.A., Beaver College), Geneva, New York
 Johnson, Harvey Hill (B.A., McMurray College), Kingwood, Texas
 Johnson, Myrtle Frances (B.A., Mary Baldwin College), Staunton, Virginia
 Johnson, Stephen Trent (B.S., High Point College), Stoneville, North Carolina
 Jones, John Mark (B.A., Furman University), Columbia, South Carolina
 Jones, Lorentz Gregory (B.A., M.P.A., University of Denver), Durham, North Carolina
 Judy, Paula Kendall (B.A., North Carolina State University), Badin, North Carolina
 Kanipe, Clarence Earl, Jr. (A.B., Duke University), Spartanburg, South Carolina
 Karges, Kelly Jay (B.S., Nebraska Wesleyan University), Doniphan, Nebraska
 Karmiol, Linda Joyce (B.S.N., Duke University), Garden City, New York
 Keller, Lutz Gottfried (B.S., Lenoir Rhyne College), Marion, North Carolina
 Kimbrough, Timothy Edward (A.B., Duke University), Durham, North Carolina
 Kiser, Howard Stephen (B.A., Appalachian State University), Lincolnton, North Carolina
 Kopp, Sandra Jean (B.A., M.Ed., Converse College), Huntington, West Virginia
 Krzywicki, VanBentley (B.S., Bucknell University), Poughkeepsie, New York
 Kurtz, Michael David (A.A., Lees-McRae College; B.A., Eastern Mennonite College), Jefferson, North Carolina
 Lamm, Kermit Alan (A.S., Mount Olive College; B.A., University of North Carolina–Greensboro), Wilson, North Carolina
 Lanier, George P. (B.A., Lambuth College), Dyersburg, Tennessee
 Larson, Mark Douglas (B.Ed., University of Wisconsin–Eau Claire), Minneapolis, Minnesota
 Latimer, C. Thomas (A.B., Duke University), High Point, North Carolina
 Laws, Alecia Ann (A.A., Central College; B.A., Greenville College; M.A., University of Houston–Clear Lake City), Pearland, Texas
 Laws, Douglas Howard (B.S., University of Houston; M.Ed., Sam Houston State University), Pearland, Texas
 Lee, Thomas G. (B.S., Eastern Mennonite College), Kilmarnock, Virginia
 Lenow, Larry E. (B.A., Trinity University), San Antonio, Texas
 Lewis, James Michael (B.A., Florida Southern College), Deland, Florida
 Lewis, Jerry Dean (B.A., Methodist College), Morehead City, North Carolina
 Lindsey, Jill Ellen (B.A., Furman University), Miami, Florida
 Lineberger, Pamela Baker (B.S., Pembroke State University; M.A., Scarritt College), Pembroke, North Carolina
 Lowry, Jerry, (B.A., Pembroke State University), Rowland, North Carolina
 Loy, Samuel White (B.A., Elon College), Burlington, North Carolina
 Luckeydoo, Charles William (B.A., West Virginia University), Point Pleasant, West Virginia
 Lupo, David Emory (B.S., Duke University), Columbia, South Carolina
 Lyon, Beth Gassert (A.B., College of William and Mary), Reading, Pennsylvania
 MacDonald, Michael Andrew (B.A., Hendrix College), Little Rock, Arkansas
 Madison, John Talton (B.A., Methodist College), Shallotte, North Carolina
 Marshall, Andrew Murdock (B.A., University of North Carolina–Wilmington), Elizabethtown, North Carolina
 Martin, Stephen Moore (A.B., Pfeiffer College), Greensboro, North Carolina
 Mason, Glenn Eldridge (B.A., Atlantic Christian College), Goldsboro, North Carolina
 Mather, Peter Charles (B.A., Indiana Central University), Bloomington, Indiana
 McCants, Gene Allen (B.S., Clemson University), Lancaster, South Carolina
 McClure, Barbara Ann Sacco (A.A., University of Maryland; B.A., Fayetteville State University; J.D., Campbell School of Law), Benson, North Carolina
 McConnell, George Ross (B.A., Belmont Abbey College), Mount Holly, North Carolina
 McDowell, Martha Ellen (B.A., Winthrop College), West Columbia, South Carolina
 McHenry, John Newell (B.A., DePauw University; M.S., Massachusetts Institute of Technology), Parle Forrest, Illinois
 McKim, Dana A. (A.B., Pfeiffer College), Miami, Florida
 McLendon, James Earl (B.A., Methodist College), Fayetteville, North Carolina
 McLeod, Deborah Avann (B.A., M.A., Boston University), Amherst, Massachusetts
 McLeod, Thomas H. (A.B., Harvard University), Lakeland, Florida
 McPherson, Charles Kris (B.S., Ball State University), Portland, Indiana
 Mecaskey, Jerald Lyle (B.S., Middle Tennessee State University), Springfield, Illinois
 Metcalf, Ellen Hope (B.A., University of North Carolina–Charlotte), Charlotte, North Carolina
 Milford, Brian Kent (B.S., Iowa State University), Council Bluffs, Iowa
 Milleson, Bart William (B.A., Pfeiffer College), Lexington, North Carolina
 Mills, William Douglas, (B.A., New Mexico State University), Las Cruces, New Mexico
 Mitchell, William Kenneth, Jr. (A.A., A.S., Northern Virginia Community College; B.A., Pepperdine University), Hillsborough, North Carolina

Moore, Donna Susan (B.A., Elon College), Elon, North Carolina
 Moore, John Albert (B.S., University of North Carolina–Greensboro), High Point, North Carolina
 Moore, Scott L. (B.A., The Citadel), Olney, Illinois
 Morton, Steven Charles (B.A., Grove City College), West Chester, Pennsylvania
 Munden, Susan Pendleton (B.A., Virginia Wesleyan College), Virginia Beach, Virginia
 Murphy, Larry Dallas (A.S., Wytheville Community College; B.A., Radford College), Galax, Virginia
 Murray, Robert Allen (B.A., University of Maryland), Bethesda, Maryland
 Murray, Thompson Williams (B.S., University of Arkansas), Wynne, Arkansas
 Narron, Georganne (B.A., Meredith College), Smithfield, North Carolina
 Nolan, Thomas Patrick (B.A., Marshall University), Wayne, West Virginia
 Norman, Lucrecia Walters (B.A., High Point College), Winston-Salem, North Carolina
 Norman, Susan Elaine (B.A., University of North Carolina–Chapel Hill), Winston-Salem, North Carolina
 Oakley, William Joseph (B.A., Florida Atlantic University), Pompano Beach, Florida
 O'Brien, Julia Myers (B.A., Wake Forest University), China Grove, North Carolina
 Oldham, Kirk Bradley (B.A., Berry College), Largo, Florida
 O'Neal, Wanda Jo (B.A., Wake Forest University), Henderson, North Carolina
 Osteen, Edward Powell, Jr. (A.B., Duke University), Durham, North Carolina
 Outcalt, Todd Edward (B.A., Indiana State University), Shelburn, Indiana
 Overby, Kathleen Adelia (A.B., College of William and Mary), Fredericksburg, Virginia
 Owen, Daniel A. (B.A., West Virginia Wesleyan College), Pittsburgh, Pennsylvania
 Palmer, David Rigg (B.A., Virginia Polytechnic Institute and State University), Winchester, Virginia
 Palumbo, Paul Kevin (B.A., Guilford College), Chapel Hill, North Carolina
 Parvin, Samuel Frank (A.A., Brevard Community College; B.A., Florida State University), Melbourne, Florida
 Pasquarello, Michael, III (B.A., Los Angeles Baptist College), Durham, North Carolina
 Pasten, Jose Agostin (B.A., Berea College), Santiago, Chile
 Pee, Charles Milton (B.S., Francis Marion College), Mullins, South Carolina
 Peele, Dale Evans (B.S.C., North Carolina Central University), Washington, North Carolina
 Pernell, Leon Jackson (A.B., University of North Carolina–Chapel Hill), Henderson, North Carolina
 Perry, Brian Darren (B.A., University of North Carolina–Wilmington), Wilmington, North Carolina
 Pheagin, Timothy Lindsey (A.B., Pfeiffer College), Asheboro, North Carolina
 Pitts, John F. (B.A., M.A., Florida State University), Tallahassee, Florida
 Poore, Samuel Franklin (B.A., University of South Carolina), Rock Hill, South Carolina
 Pope-Levison, Priscilla (B.M., DePauw University), Cincinnati, Ohio
 Porter, Timothy Richard (A.A., Hiwassee Junior College; B.A., Tennessee Wesleyan College), Greensboro, North Carolina
 Powell, Staccato (B.A., University of North Carolina–Charlotte), Hallsboro, North Carolina
 Prince, Constance Marie (B.A., North Carolina Central University), Durham, North Carolina
 Pruett, Vickie Sue (B.A., Marshall University), Bluefield, West Virginia
 Purdy, James Herbert, IV (B.S., University of North Carolina–Greensboro), Greensboro, North Carolina
 Pyatt, James Lattimore (A.B., Duke University; A.M., University of Pennsylvania), Statesville, North Carolina
 Queen, Dolores Barus (A.A., Western Piedmont Community College; B.A., Lenior Rhyne College), Connelly Springs, North Carolina
 Radford, Jack Russell (B.A., North Carolina State University), Raleigh, North Carolina
 Randall, Norris Ashley, Jr. (B.A., Huntingdon College; M.S., University of North Carolina–Greensboro), Phenix City, Alabama
 Rankin, Nancy Burgin (B.A., High Point College), High Point, North Carolina
 Ratliff, Joseph Lee (B.A., Shaw University), Raleigh, North Carolina
 Reavis, James Lewis (A.A., Louisburg College; B.A., North Carolina Wesleyan College), Henderson, North Carolina
 Reeves, William Orien (B.A., Hendrix College), Sheridan, Arkansas
 Reuter, Mark Aaron (B.A., Mars Hill College), Eden, North Carolina
 Rich, Howard Michael (B.A., Huntingdon College), Elba, Alabama
 Richter, Richard Lester (B.A., DePauw University), Connersville, Indiana
 Robbins, Michael Steven Bryant (B.A., California State University–San Bernardino), Escondido, California
 Robertson, Terry Alan (B.S., United States Coast Guard Academy), Akron, Ohio
 Robinson, Christopher Samuel (B.S., Grambling State University), Wampu, South Carolina
 Rollins, Robert William (A.S., Wingate College; B.M., University of North Carolina–Greensboro), Hillsborough, North Carolina
 *Rose, Vernon Julius (B.A., University of Western Cape), Cape Town, South Africa
 Roth, William Errett (B.A., Huntington College), North Manchester, Indiana
 Rowe, Jack Heavilin (B.S., University of North Alabama; M.S., University of Alabama), Florence, Alabama

*Samuel, James R. (B.A., Livingstone College), Kannapolis, North Carolina
 Sanchez, Horacio (B.A., Barrington College), Providence, Rhode Island
 Scanlan, Carla (B.S., Indiana University; M.A., Florida State University), Fayetteville, North Carolina
 *Scott, Robert Keith (B.A., Mars Hill College), Murphy, North Carolina
 *Sexton, Kenneth Bryan, Jr. (A.B., Duke University), Leasburg, North Carolina
 Shoaf, Timothy Fred (B.M., Greensboro College), Mocksville, North Carolina
 *Showers, Jeffrey Bruce (B.A., Huntingdon College), Huntsville, Alabama
 Smart, William David, Jr. (B.S., Miles College), Stratford, Connecticut
 Smith, Charles Cooper (B.A., Virginia Wesleyan College), Beaufort, North Carolina
 Smith, Timothy Hill (B.A., High Point College), Walkertown, North Carolina
 Snedeker, Kathryn Sue (A.B., Albion College), Ann Arbor, Michigan
 Snyder, Timothy Wayne (B.A., University of North Carolina–Chapel Hill), Raleigh, North Carolina
 Somers-Ingersol, Cheryl Lynn (B.S., University of Kansas), Tulsa, Oklahoma
 Sommerville, Raymond Ronald (B.A., Miles College), Jacksonville, Florida
 Sorrells, William Lyn (A.B., University of North Carolina–Chapel Hill), Dallas, North Carolina
 Speight, John C., Jr. (B.S., Old Dominion University), Virginia Beach, Virginia
 Spengler-Aikens, Margaret (B.S., Pennsylvania State University), Harrisburg, Pennsylvania
 Stanley, Miles Eugene (B.A., Atlantic Christian College), Burlington, North Carolina
 Stevenson, Zollie J. A., Jr. (B.A., University of North Carolina–Asheville; M.S.Ed., North Carolina Agricultural and Technical State University), Greensboro, North Carolina
 Stewart, Aaron H. (A.B., Duke University), Greensboro, North Carolina
 Stewart, John Bruton, Jr. (B.A., University of North Carolina–Chapel Hill), Winston-Salem, North Carolina
 Stewart, Lawrence Landon (B.A., DePauw University), New Ross, Indiana
 Straus, Phyllis H. (B.A., University of North Carolina–Chapel Hill), Oxford, North Carolina
 Strother, Jonathan Eric (B.A., Methodist College), Sanford, North Carolina
 Surret, David Cofield (B.S., University of South Carolina–Aiken), Aiken, South Carolina
 Swartz, Alan Ples (B.A., Methodist College), Salemburg, North Carolina
 Tapper, Lona L. (B.S., Virginia Commonwealth University), Richmond, Virginia
 Tate, Wendy Elizabeth (B.A., West Virginia Wesleyan College), Alexandria, Virginia
 Tatum, Jimmie Ray (B.A., University of North Carolina–Wilmington), Elizabethtown, North Carolina
 Terrell, Allen D. (B.A., Fayetteville State University), Silver Spring, Maryland
 Thomas, William Chandler (B.S., Ferrum College), Montvale, Virginia
 Thompson, John Richard (B.A., Albion College; M.A., Ph.D., Duke University), Jackson Springs, North Carolina
 Thompson, Kenneth Pope (A.A., North Florida Junior College; B.S., Florida State University), Quincy, Florida
 Tolbert, Michael Randall (A.A.S., Gaston College; B.E.T., University of North Carolina–Chapel Hill), Trinity, North Carolina
 Tony, Pat B. (B.S., Longwood College; M.Ed., University of Virginia), Crewe, Virginia
 Townsend, William Clayton (B.A., Pembroke State University), St. Pauls, North Carolina
 Trotter, John Albert (B.M., Greensboro College), Durham, North Carolina
 Tucker, David Wayne (B.A., Ouachita Baptist College; M.A., J.D., University of Arkansas), Fayetteville, Arkansas
 Turner, Kevin Roshell (B.A., University of North Carolina–Chapel Hill), Waynesville, North Carolina
 Tuttle, Bruce Douglas (B.A., M.A., Virginia Polytechnic Institute and State University), Danville, Virginia
 Tyson, John Horton (B.A., Atlantic Christian College), Rougemont, North Carolina
 Van Horn, Linda Jane (B.S., Seton Hall University), Lyndhurst, New Jersey
 Vanlandingham, Brian (B.A., University of Florida), Eustis, Florida
 Vesper, Carolyn Cater (A.B., Duke University), Hutchinson, Kansas
 Wade, David Carlton (A.A., Brevard College; B.A., Methodist College) Bonlee, North Carolina
 Wagner, Marlene Slye (A.B., Duke University), LaCanada, California
 Walker, Edward Richard (A.B., College of William and Mary), Newport News, Virginia
 Walker, Elaine Virginia (B.A., College of William and Mary), Arlington, Virginia
 Walker, Patricia Kelli (B.A., Southwestern University–Memphis), Ripley, Tennessee
 Warren, William Arthur (B.A., University of North Carolina–Wilmington), Salemburg, North Carolina
 Watkins, James Patterson (B.S., North Carolina State University), Rocky Mount, North Carolina
 Watts, Jerry Bryson (B.A., Mars Hill College) Candler, North Carolina
 Weathersbee, Danny Russell (B.A., Union University), Covington, Tennessee
 Weathersbee, Joy Shelby (B.M.Ed., Lambuth College), Covington, Tennessee
 Webb, James Thomas, Jr. (B.A., University of North Carolina–Chapel Hill), Denton, North Carolina
 Whetstone, Mary Sue (B.A., DePauw University), Carmi, Illinois
 White, Barry Maxville (B.A., University of South Florida), Tampa, Florida
 White, James Willard (Th.B., John Wesley College; B.A., Asbury College; M.A., Wake Forest University), Morganton, North Carolina

White, Quentin Jerome (B.A., Wilberforce University), Bedford, Ohio
 Wilkerson, Richard Phillip (B.A., Tulane University; M.A., University of North Carolina—Chapel Hill), Chapel Hill, North Carolina
 Wilkins, Mark Marimen (B.A., Valparaiso University), Merrillville, Indiana
 Williams, William Franklin (A.B., Pfeiffer College), Sanford, North Carolina
 Wingert, James Rudolph (B.A., Virginia Wesleyan College), Midland, Texas
 Wood, Linda Susan (B.A., Meredith College), Charlotte, North Carolina
 Wooten, Dana Bruce (A.A., Mount Olive Junior College; B.A., Appalachian State University), Greensboro, North Carolina
 Yates, Walter George (A.B., High Point College), Charlotte, North Carolina
 Yorkey, Camille Ogle (B.A., Greensboro College), Durham, North Carolina
 Yow, William Joseph (B.A., High Point College), Sanford, North Carolina

Candidates for the Master of Religious Education Degree

Booth, Susan (A.B., Duke University), Durham, North Carolina
 Cockman, Leslie Carol (B.S., High Point College), Asheville, North Carolina
 Hutchins, Catherine Louise (B.A., Pfeiffer), Gastonia, North Carolina
 Murphy, Karen Neola (B.A., Huntingdon College), Pensacola, Florida
 Palmer, Deidre Edith (B.A., University of Adelaide), Adelaide, South Australia
 Small, Anita Lister (A.B., Duke University), Elizabeth City, North Carolina

Candidates for the Master of Theology Degree

Bush, John Ellison (B.A., St. Andrews Presbyterian College), Augusta, Georgia
 Crews, Rowan, Jr. (A.B., Davidson College; M.Div., Duke Divinity School), Myrtle Beach, South Carolina
 Duncan, Charles Richard (B.A., Lenoir Rhyne College; M.A., Central Michigan University; M.Div., Lutheran Theological Southern Seminary), Hickory, North Carolina
 Franzen, David Michael (B.A., Gustavus Adolphus College; B.D., Lutheran School of Theology—Chicago), Langford, South Dakota
 *Girgaos, John Garabed (B.S., American University of Beirut; M.D. American University of Beirut Medical School; M.Div., Duke Divinity School), Durham, North Carolina
 Leins, Curtis Edward (A.B., Lenoir Rhyne College; M.Div., Lutheran Theological Southern Seminary), Goldsboro, North Carolina
 Mericle, Skip Sterling (A.B., Duke University; M.Div., Duke Divinity School), Durham, North Carolina
 Murphy, Larry Edwin (B.S., Trevecca Nazarene College; M.Div., Nazarene Theological Seminary), Fairmont, West Virginia
 *Myers, Charles Donald (B.A., Wake Forest University; B.D., Union Theological Seminary), Reidsville, North Carolina
 Neblett, Emma Lou (B.A., Elon College; M.Div., Duke Divinity School), Burlington, North Carolina
 Taylor, Franklin (B.A., Oakwood College; M.Div., Andrews University; D.Min., San Francisco Theological Seminary), Durham, North Carolina
 *Vesper, Keith R. (B.S., University of Kansas; M.Div., Duke Divinity School), Hutchinson, Kansas
 Wilson, Meretle (B.A., Oakwood College; M.Div., Andrews University), Monroe, Michigan

Special Students

Blake, Debra Ann (B.A., M.Ed., University of North Carolina—Greensboro), Greensboro, North Carolina
 Bowden, Julia Webb (B.A., Huntington College), Durham, North Carolina
 Carter, Phillip (A.A., Surry Community College; B.A., University of North Carolina—Chapel Hill; M.Div., Southeastern Theological Seminary), Benson, North Carolina
 Corey-Seriver, Sheryl Smith (A.B., Duke University), Chapel Hill, North Carolina
 Early, Laura Gunter (B.A., North Carolina State University), Durham, North Carolina
 Grega, Darlene (B.A., Valparaiso University), Durham, North Carolina
 Inskeep, Robert Gail (Virginia Polytechnic Institute and State University) Raleigh, North Carolina
 Jones, Logan Carroll (A.B., Davidson College; M.A., University of Alabama—Birmingham M.Div.; Duke Divinity School), King, North Carolina
 Laidlaw, Mary Susan (B.A., Wake Forest University; M.Div., Southern Seminary), Durham, North Carolina
 Millner, Bollin Madison, Jr. (B.A., University of Richmond; M.T.S., Virginia Theological Seminary), Raleigh, North Carolina
 Nice, Evelyn Godshall (R.N., Grand View Hospital School of Nursing), Durham, North Carolina
 Parkerson, Sue Tuck (B.A., Southern Methodist University; M.Div., Duke Divinity School; Ph.D., Boston University) Durham, North Carolina
 Puder, Dirk (ABITUR, Carl-Duisenberg Gymnasium), Leverkusen, Germany

Scurry, Frank Preston (B.B.E., Columbia Bible College; M.A., Columbia Graduate School of Bible and Missions), Siler City, North Carolina

Smith, Carol Turner (B.A., Mobile College), Ocean Springs, Mississippi

Suber, James Whitley (B.S., B.A., East Carolina University), Raleigh, North Carolina

Vehorn, James Ronald (B.A., Clemson University; M.Div., Erskine Theological Seminary), Bennettsville, North Carolina

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